Self-Study Report  
in preparation for  
Comprehensive Review  
of the  
Department of Statistics  
North Carolina State University  
January 2013

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PREFACE

This Self Study Report has been compiled in preparation for the comprehensive review of the Department of Statistics in January 2013. The goal of this work is to document our composition, accomplishments, and activities, as well as our current issues and aspirations.

The Department of Statistics at North Carolina State University offers both undergraduate and graduate degrees in Statistics. Its faculty is comprised of 10 Assistant Professors, 17 Associate Professors, 17 Full Professors, as well as 3 with visitor/emeritus status, and 2 with associate status. Its activities are supported by 9 administrative and computing staff.

The Department of Statistics is led by Dr. Montserrat Fuentes as Head of the Department, assisted by Dr. Dennis Boos as Associate Head. Dr. Roger Woodard directs the undergraduate program, as well as serves as Assistant Head. Dr. Sujit Ghosh and Dr. John Monahan serve as co-directors of the graduate program. Dr. Kimberly Weems serves a variety of roles and completes the Administration Team of the Department.

Since the regular evaluation of the graduate program in part prompted this review, we have followed the structure and numbering prescribed by the NC State Graduate School for Sections I through IX of this Self Study Document. A discussion of Research Working Groups and Other Programs follows in Section X to reflect both the research within the discipline of Statistics and the extensive interdisciplinary research activities in the Department. The consulting activities of the Department comprises Section XI. Section XII presents the material for the review of the undergraduate program. Lists of course information and enrollments for service courses follow in Section XIV, for undergraduate courses in Section XV, for graduate courses in Section XVI, and for special topics courses in Section XVII. A compilation of curriculum vitae for the faculty forms Section XVIII.
I. PROGRAM DESCRIPTION

1.1 Exact Title of Program: Statistics

1.2 Department or Interdisciplinary Group Authorized to Offer Degree Program(s)

Department of Statistics

1.3 Exact Titles(s) of Degrees Granted


1.4 College or School:

College of Physical and Mathematical Sciences

1.5 Brief History and Mission

The Department of Statistics at North Carolina State University was founded in 1941 for the purpose of providing statistical consulting services and teaching service courses in Statistics. As research and teaching activities in the Department increased in the mid-1940’s, a formal graduate program was established in cooperation with the Department of Statistics at UNC-Chapel Hill (UNC-CH) and with the support of the Institute of Statistics. After the initial years, the graduate programs of the two departments developed independently and officially separated over 40 years ago. At first, the UNC-CH program concentrated strictly on probability and mathematical statistics while NCSU focused on what it referred to as experimental statistics. In spite of the passage of time, each still maintains vestiges of its earlier orientation. The Department awarded its first Master’s degree in 1945 and its first PhD degree in 1948.

The Department of Statistics strives to build on its reputation as a nationally prominent center for research and education in Statistics. While it keeps sight of its mission of being concerned with Statistics as it is applied to real problems, the department endeavors to build and maintain strength in the core. The common thread linking the NCSU faculty (and students) is that their research, be it applied, methodological, or theoretical, is motivated by applications.

The mission of the department is to achieve outstanding research teaching, mentoring, consulting, and collaborations on campus and world-wide, within a cohesive and diverse department, where all students, faculty and staff receive fair and equitable treatment.

1.6 Degree Program Objectives and Outcomes

The Graduate Program has established the following four objectives: 1) to enable students to develop into successful professionals for employment in desirable positions in academe, government and industry; 2) to prepare doctoral students to be effective
researchers in the field of Statistics; 3) to enhance the visibility and stature of our graduate programs, while maintaining and improving their quality; 4) to advise and mentor students to help them be successful. The accompanying outcomes express realizations of these objectives; the full list is given in Appendix O for Outcomes.

1.7 Responsiveness to Local and National Needs

According to the American Statistical Association, “The demand for statisticians is currently high and growing.” The US Bureau of Labor Statistics forecasts a growth of 14% or over 18,000 in the jobs for statisticians from 2010 to 2020, with a Master’s degree as the typical entry level training. Many of our graduates work in the North Carolina Triangle area, in pharmaceuticals such as GSK, CRO’s such as PPD and Quintiles, and software companies such as SAS. The need for statisticians is growing in all of these areas. Our own Jobs Blog, driven by inquiries to the department or other job postings, has more than 160 postings over for the past five years, with more than 35 from North Carolina.

In response to these needs, we have strengthened our training in Biostatistics. In recent years, we have expanded our course offerings in computing. To address needs in a more general fashion, we are considering expanding and changing the format of our consulting course.

1.8 Program Quality

The graduate program of the Department of Statistics at NC State is generally regarded as one of the best in the nation. It has been ranked among the top 10 in popular ratings such as the US News and World Report. Discussion of the Department’s research ranking by National Research Council will be discussed in detail in Section 6.2. In other measures, our students and faculty regularly win ‘Best Paper’ recognition; the faculty take many leadership roles in the American Statistical Association and the Biometric Society, including recently two ASA Presidents and five editors of prominent journals. Some of the standard textbooks in the field have been written by our faculty.

1.9 Administration

The Director(s) of the Graduate Program (DGPs) are responsible for the operation of the graduate program, directing graduate admissions, advising, assignment of financial support and duties to students. Currently the duties are divided between two senior faculty as co-Directors. One co-DGP handles curricular issues: approving Plans of Work, assigning nominal advisors for new students. The other co-DGP manages student support (TA/RA/GIT) and makes TA assignments. Both co-DGPs collaborate on admissions and support decisions, as well as general graduate student advising. These co-Directors are appointed by the Head of the Department. The co-Directors make recommendations to the Head, Associate Head, and Assistant Head regarding committee assignments, as well as course offerings and teaching assignments. The co-DGPs are assisted by a Graduate Program Coordinator who handles the details and day-to-day operations.
Four faculty committees are key to the functioning of the graduate program. A committee of five faculty is appointed twice each year for the administration of the Basic Exam. Current or recent instructors of the core courses often serve on this committee, but most faculty will serve on this committee at times during their career. Reflecting the broad range of research in the Department, the Written Preliminary Exam Committee requires a broad range of expertise and has eight to ten members, depending on the number of students attempting that year. The Graduate Admissions committee is expanding to five members to handle the growth in the number of applications. The standing Course and Curriculum Committee reviews the status of the graduate and undergraduate programs and evaluates proposed changes in courses, requirements, and exam procedures.

II. FACULTY

2.1 Faculty List and Curricula Vita

Appendix A contains the list of faculty members with numbers of student committees chaired. The compilation of 2-page curriculum vitae can be found in Section XVII. The graph below gives a brief snapshot of the faculty by gender, rank, and experience.
2.2 Visiting, Part-Time and Other Faculty

We have data for the last 3 years, but there are only a few cases of non-graduate faculty teaching graduate courses. Generally we monitor very closely those who teach graduate courses. Current post-doc Elizabeth Mannshardt co-taught the Advanced Spatial course as a special topics course (ST 810) with Montse Fuentes in Fall 2012. Justin Post, one of our recent Ph.D graduates, taught ST 512 in Summer 2012. Another recent grad, Shenek Alston, taught ST 511 in Fall 2011. David Reif (EPA) twice taught a special one-credit computing course (ST 610) on R.

2.3 Advising

Each graduate student enrolled in the department is assigned an academic advisor. Every Master of Statistics student is required to have an advisory committee consisting of at least two Statistics faculty members, one of whom serves as chair. The committee is initially appointed by the Director of Graduate Program. The chair of the committee also serves as the student's academic advisor. Changes to the committee, if needed, can be requested through the Director of Graduate Program. All committee appointments and any changes to the committee must be approved by the Graduate School.

Ph.D. advisory committees are composed of at least four faculty members. At least three committee members, including the chair, must be from the Department of Statistics. The committee must also include a faculty member from outside the department. If the student submits a committee of four statistics faculty, the graduate school will appoint a Graduate School Representative to the committee. The committee must be approved by the Director of Graduate Program, as well as by the Dean of the Graduate School.

The initial assignment of an advisor to a student pursuing the Ph.D. degree is understood to be temporary. A change can be made if, for example, the student develops an interest in a research program of a different faculty member. Any changes in advisors or committee members must be approved by the Director of Graduate Programs. A faculty member from another university or a professional from industry or government may serve on a student advisory committee as an external member, with full voting rights, along with the required committee composed of four members of the NCSU Graduate Faculty. The credentials of the external member should be comparable to those required for membership on the Graduate Faculty. It is necessary to submit the external member's resume to the Graduate School.

As the Graduate School rules require full status to chair a doctoral committee, whenever a junior faculty member is directing a student, a more senior faculty member is added to the committee in the role of co-chair. In addition to providing direction to the student, the senior co-chair regularly guides the junior co-chair in how to direct a doctoral student. While sometimes the junior faculty’s research mentor serves as senior co-chair, more often the relationship is driven by research interests. The DGPs often consult with the student and/or faculty about the committee composition before approving the Plan of Work (PoW) and the graduate committee.

Direction of doctoral research is the most critical advising activity in the Department and the most demanding in terms of manpower. We have been fortunate that the number of faculty on
leave have continued to mentor their graduate students while they have been away. In addition, in recent years junior faculty have been shouldering the advising load at a rate comparable to senior faculty (see Appendix A). While the absence of these faculty have caused no major disruptions in the short term, we would not be able to continue the size of doctoral program should these faculty not return nor be replaced.

2.4 Faculty Quality

Each faculty members submits a Faculty Activity Report (FAR) every year. This report lists all the relevant activities and accomplishments for the year like papers published, talks given, etc. The Department Head uses those FARs along with teaching evaluations (both student and peer reviews) to give feedback to each faculty member and also to determine raises when those are allowed by the legislature.

2.5 Faculty Distribution

The faculty is very diverse in research expertise, and we are seeking to add strength in bioinformatics, forensic statistics, data analytics, and personalized medicine through the Chancellor’s Excellence Cluster Initiatives. We could use new faculty in traditional areas like sampling and design of experiments because large groups of CALS faculty and students need that expertise. Currently we do not have any faculty with expertise in Social Science research.

We also have diversity in roles. Although most of our faculty are in traditional tenure track positions, we have four Teaching Associate or Assistant Professors (TAPs) and two Research Assistant Professors (RAPs). Both perform essential duties. The TAPs are teaching experts who can handle large and demanding student populations and a wide range of classes. Moreover, they help with running the department and give leadership in teaching techniques, especially with respect to online, hybrid, and associated new technologies. One RAP (Consuelo Arellano) does large amounts of face-to-face consulting with College of Agriculture and Life Sciences (CALS) faculty, an important aspect of our relationship with CALS. The newly-hired other RAP, Emily Griffith, will be our main contact with the Vet School, and will help us develop closer ties with their faculty.

III. GRADUATE STUDENTS

3.1 Enrollment

In the last 10 years, total graduate enrollment in Statistics has risen from 129 in 2002 to 143 in 2011, a 11% increase. During this period of growth, enrollment in master’s programs decreased significantly, from 71 in 2002 to 12 in 2011. During the same period, the doctoral program increased significantly, from 58 in 2002 to 131 in 2011, a 126% increase. The department periodically reviews its levels of graduate enrollment in relation to the availability of faculty resources, financial support, space, and infrastructure. The increase in doctoral students reflects a deliberate decision to redirect the effort of the department, although the figures exaggerate the growth in the program due to an accounting quirk. Currently, the department
admits most students directly into the Ph.D. program who previously were considered master’s students until they had passed the qualifier.

This realignment of enrollments has been consistent with the objectives of the university's mission which emphasizes doctoral study. Enrollment levels will be reviewed in the future, particularly in view of anticipated changes in the program. For instance, beginning May of 2013 the department plans to launch a new one-year Master's program which may substantially increase the enrollment in master's program. At issue is the goal of increasing quality as a trade-off for quantity. Graduate enrollment of US (domestic) students has substantially increased from 45% in 2002 to about 55% in 2011 out of which about 78% are NC resident.

Enrollments of minorities have increased from 21% in 2002 to 26% in 2011 among the US students. For underrepresented minorities, the enrollments rose from 6% to 17%. To a large extent this reflects the department’s continuing commitment to maintain diversity. For all graduate students, mentoring is a key determinant in a successful outcome. This is particularly true for minorities who often find themselves isolated and lacking a sustaining support system. Female applicants find this program attractive partly because of the relatively large number of female faculty (15, 34%) and female graduate students (74, 49%).

### 3.2 Quality of Incoming Students

Students applying to any of our graduate programs are required to submit an application that includes a statement of academic and career goals, transcripts covering all post secondary academic work, three letters of recommendation, and GRE General Test scores. GRE Subject Test scores are not required. Most international applicants are also required to submit TOEFL scores.

The central issue for granting an applicant admission to our Master’s program is the likelihood that he or she will be successful in getting a job in industry or to continue to a PhD program. In practice this means that, at a minimum, applicants to the Master’s programs must be completing a baccalaureate degree with a GPA (or Mathematics GPA) of at least 3.0 and have earned good grades (A’s and B’s) in a three- or four-semester calculus sequence, a course on linear algebra and a basic probability and statistics course. A GRE quantitative score in the range 730 to 800 (old scale) and a verbal score in the range 500 to 595 are also considered minimum. The average GRE quantitative score of admitted students increased from 742 in 2002-2003 to 785 in 2011-2012 and the average GRE verbal score of admitted students increased from 539 in 2002-2003 to 588 in 2011-2012. The average undergraduate GPA of admitted students increased from 3.55 in 2002-2003 to 3.83 in 2011-2012.

Sometimes exceptions are made to these admission rubrics to take into account, for example, improvement in more recent years, differences in grading standards, favorable comments of a reference, or offsetting strength elsewhere in the application. On rare occasion, applicants not meeting these standards are sometimes admitted provisionally but rarely and given the opportunity to make up deficiencies and demonstrate competency by earning good grades in specified remedial courses.
In addition to meeting minimum standards, the ideally prepared applicant also has earned good grades in a two-semester sequence in advanced calculus or real analysis and a two-semester applied statistics sequence.

Members of the admissions committee independently review each application and provide written recommendations covering admission and financial aid. Each member has his or her own orientation and evaluates strengths and weaknesses differently. The DGPs add their evaluations and make a summary recommendation to the Graduate School. Because the terms of service of faculty are staggered, the admissions committee always has members with experience.

Currently, we largely recruit students for the doctoral program and we are able to support most of the students that we admit. For 2011-12, 87% of the doctoral students were supported by the Department. As a result, students are admitted initially to the doctoral program; master’s students are comprised of unsupported students and transfers from other graduate programs at NC State. Normally, graduate students take the Basic Exam before the start of their third semester. This means that students know early on whether they can continue to the PhD or complete the master’s program. Most students continuing for a PhD complete the master’s degree en route, but not all. Applicants to the PhD program who have earned Master’s degrees from other departments may be admitted directly to the PhD program but are still required to pass the Basic Exam at the PhD level.

### 3.3 Quality of Current/Ongoing Students

The Statistics graduate program is one of the largest in the country, with about 150 graduate students. It attracts a diverse set of quality students from around the world. The Department provides a dynamic environment for teaching, core research and collaborative research across disciplines, with formal programs in genetics, environmental statistics, and financial statistics, as well as biostatistics, bioinformatics, and biomathematics. It also has strong programs in statistics education, mathematical statistics, and work in a wide range of applications.

Students currently enrolled in the program are expected to maintain a GPA of 3.0 to obtain financial support from the department. Majority (over 80%) of our graduate students in Statistics are supported as Teaching Assistants(TAs), Research Assistants(RAs), Graduate Fellowships and Graduate Industrial Trainees (GITs). Assistantships are awarded on a merit basis. As a general rule, only students who are pursuing a doctoral degree in Statistics are supported. Students are required to submit annual Progress Reports signed by both the student and the advisor. Based on these Progress Reports, performance of the students are measured by several criteria which include their cumulative GPA, papers published in peer reviewed journals, talks and seminars presentations, seminars attendance records, travel awards, fellowships, performance as a teaching/research assistant and various activities that promotes developing skills for good citizenship. Overall, the average cumulative GPA is about 3.6 among the currently enrolled domestic students (including Masters and PhDs); among the international students the average GPA is about 3.8. Our students have won numerous awards at national and regional level over the past few years. A few notable recent awards include NSF Travel award, ASA Biopharmaceutical section student paper award, two NSF graduate research fellowships, AT&T fellowship, SAS fellowship, USGA outstanding teaching assistant award etc.
3.4 Degrees Granted

The following table summarizes data on time to completion of degrees and degrees granted for students entering graduate programs over the last 10 years.

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>PhD</th>
<th>MR/MS</th>
<th>Avg Years to PhD degree completion</th>
<th>Avg Years to Masters degree completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002-2003</td>
<td>15</td>
<td>37</td>
<td>3.96</td>
<td>2.16</td>
</tr>
<tr>
<td>2003-2004</td>
<td>9</td>
<td>37</td>
<td>3.91</td>
<td>1.94</td>
</tr>
<tr>
<td>2004-2005</td>
<td>12</td>
<td>33</td>
<td>3.42</td>
<td>2.02</td>
</tr>
<tr>
<td>2005-2006</td>
<td>13</td>
<td>28</td>
<td>3.69</td>
<td>1.90</td>
</tr>
<tr>
<td>2006-2007</td>
<td>22</td>
<td>30</td>
<td>4.13</td>
<td>1.97</td>
</tr>
<tr>
<td>2007-2008</td>
<td>14</td>
<td>26</td>
<td>4.80</td>
<td>2.31</td>
</tr>
<tr>
<td>2008-2009</td>
<td>16</td>
<td>19</td>
<td>4.88</td>
<td>2.12</td>
</tr>
<tr>
<td>2009-2010</td>
<td>19</td>
<td>31</td>
<td>5.29</td>
<td>1.65</td>
</tr>
<tr>
<td>2010-2011</td>
<td>14</td>
<td>29</td>
<td>5.79</td>
<td>1.74</td>
</tr>
<tr>
<td>2011-2012</td>
<td>20</td>
<td>38</td>
<td>5.45</td>
<td>2.45</td>
</tr>
</tbody>
</table>

From the table it is evident, over the last ten years, the average time required to complete the Master’s degree has remained close to 2 years. For students enrolled in the doctoral program, the average time required to complete the Ph.D. has risen to 5.2 years over the last five years. The distribution of completion times is slightly skewed to the high side. This is because a few of our students, more likely those with family responsibilities, take full time jobs in the area before they have completed their dissertations. The program is designed to take roughly three years past the Master’s. The failure rate on Master’s Written Examination has been about 13% on their first attempt, but only 6% overall. Except for one or two students each year, the remaining students eventually obtain either a Master of Statistics or a co-major Master’s degree. Among the 20-25 students that pass the Basic Exam at the PhD level each year (60%), some decide not to continue for the PhD, and occasionally students fail the Ph.D. Preliminary Written Examination, averaging about one per year (5 of 117 in last 6 years). The attrition rate is very low after passing the Ph.D. preliminary written examination, though a few students skew the distribution of time to degree.

3.5 Need/Placement

It has been often reported that there is a shortage of statisticians, especially biostatisticians. While the economic downturn has no doubt dampened the demand, a shortage does now exist. Locally, industries and governmental units in Raleigh, Durham and the Research Triangle Park as well as the three major universities in the area employ a large number of statisticians. Graduate seeking to remain in the Triangle area are often successful at finding local employment. Elsewhere in North Carolina, the bulk of the demand comes from the larger industries such as pharmaceutical, financial, food, and power companies, as well as from smaller colleges and universities. Regionally and nationally there is an increasing demand by government, universities, and
industry for both Master’s and Ph.D. level statisticians.

The Department provides assistance in a variety of ways to its students (and alumni) in finding positions and maintains an online job blog. As part of the mentoring process, students become aware of resources that can help with their job search. Job solicitations that come to the department are distributed widely by email and job blog. Through the department’s several hundred Master’s and PhD alumni, and through the usual collegial network, our faculty have connections throughout the country that are useful in assisting students in finding positions. By providing partial financial support, the department encourages senior level students to attend meetings of professional statistical societies. Along with other benefits, these trips provide an opportunity for students to meet with prospective employers.

Even though we know where most of our recent graduates are working, no official record is kept on their placements. For the most part, we keep track of their whereabouts by maintaining contact after they leave.

Based on the fact that the number of applications for admission has increased (e.g., 211 in 2002-2003 to 543 in 2011-2012), we feel that student demand for our programs has increased measurably over the past five years. This may be partly due to increases in the Department’s recruiting effort. This increase in applications has been experienced for US applicants but to a greater degree with foreign applicants. In particular, we have experienced a large increase in applications from India, Korea, and the People's Republic of China. The Department is optimistic that demand will continue to grow thanks to several factors. Among these are the demand created by the availability of good paying jobs for graduates, the long standing reputation of the Department of Statistics at NC State, and the ongoing effort to maintain and enhance that reputation through outstanding research and teaching, and the growing perception of North Carolina and the Research Triangle area as attractive places to attend school and live.

3.6 Funding

Students who receive financial aid are expected to carry a full academic load (usually at least 9 hours) and maintain a GPA of 3.0. Normally, financial aid commitments are made for no more than one year at a time. Doctoral students who have already completed a master's degree in a related field (e.g., Statistics, Mathematics, Economics) are supported for eight semesters while students who do not already hold a master's degree are supported for ten semesters.

The usual half-time assistantship calls for a service obligation of 20 hours per week. Those students receiving assistantships or fellowships receive health insurance coverage and as well as certain amounts of in-state and out-of-state tuition via the Graduate Student Support Plan (GSSP). Students are responsible for paying their own fees.

Graduate Student Support Plan (GSSP: http://www.ncsu.edu/grad/support-plan/)

The Graduate Student Support Plan (GSSP) is a highly competitive support package used to attract top students to NC State. Under the Plan, graduate students supported on a teaching or research assistantship or a fellowship currently receiving a minimum stipend of $8,000
annualized and who meet the minimum registration requirement, receive (at no cost to the student) health insurance and (for a limited number of semesters) tuition. As part of this package, the university provides “tuition remission” funds for defraying the difference between in-state and out-of-state tuition for out-of-state students appointed to assistantships. These are state-appropriated funds that are administered by the Graduate School and allocated to the colleges and, in turn to the departments. The Graduate Student Support Plan provides tuition support for a maximum of 4 semesters for Masters students since initial enrollment and for a maximum of 10 semesters for PhD students with no previous Masters degree in Statistics. The GSSP surely affects the pace of progress for graduate students. For well qualified students admitted from their baccalaureate, the usual pace is to take the core master’s courses in the first year, then the Basic Exam in August, the core PhD core courses in the second year and then the Written Prelim Exam, leaving three years of support to complete their dissertation. Less well prepared students may delay taking the Written Prelim, reducing the time available for research. The route for students coming with a Master’s degree depends on the nature and strength of the program. Students coming from Math or a statistics program without a strong preparation in basic courses may need to follow the same plan as those coming without a master’s degree in Statistics, while others may start with the PhD core courses in Fall, take the Basic Exam in January, and the Written Prelim the following summer.

The department has several sources of funding for graduate students. Students may be funded by: Graduate Teaching Assistantships (TAs): The main function of the teaching assistant is to help the faculty with the teaching program. Half-time teaching assistant appointments carry responsibilities that require about 20 hours per week and run up to nine months, from mid-August through mid-May. Typically teaching assistants will be assigned to grade papers and provide tutorial assistance to students for one or more courses. Students with sufficient training in Statistics and fluency in English may be asked to serve as a lab instructor or as an instructor for a section of an undergraduate course.

Graduate Research Assistantships (RAs): Several faculty members appoint students to research assistantships, normally in the second or later years of study. The function of the research assistant is to assist designated faculty members with their research or consulting programs. In each case, the specific duties and responsibilities of the research assistant will be determined by the supervisor. Research assistant appointments normally carry a 20-hour per week obligation and run for twelve months.

Graduate Industrial Traineeships (GITs): Graduate Industrial Traineeships arise out of relationships between the department and local organizations or companies. The function of the industrial trainee is to assist designated industry researchers with their research, consulting and training programs. Industrial trainee appointments may require students to spend up to 20 hours per week during regular semesters (Fall and Spring) at the sponsoring industry. During summer sessions GITs may work full-time up to 40 hours a week. Traineeships normally run for twelve months. Because of the department's proximity to Research Triangle Park, there are many local companies with which students can train.

Graduate Fellowships (GFs): The following fellowships are available:
• Cox Fellowship: Fellowships are provided through the department's Gertrude M. Cox Fellowship Fund and are awarded on the basis of academic excellence to either incoming or continuing students in statistics. The Cox Fellowship Fund was established to honor Miss Gertrude Mary Cox, who organized the Department of Statistics as one of the first in the nation at NCSU and was instrumental in developing the internationally renowned Institute of Statistics. Cox Fellows receive a nine-month stipend in addition to full waiver of tuition and fees. They carry no service obligation but fellows are expected to carry full academic load and maintain a strong academic record.

• SAS Fellowship: Fellowships are provided through the SAS Fellowship Fund and are awarded on the basis of academic excellence to either incoming or continuing students in statistics. SAS Fellows receive a twelve-month stipend in addition to full waiver of tuition and fees. They carry some service obligation at SAS and fellows are expected to carry full academic load and maintain a strong academic record.

Other sources of funding: Students may be funded through other sources including national fellowships (e.g. NSF), university fellowships, including NCSU Diversity Fellowships, or other fellowships that the department sponsors.

IV. CURRICULUM/INSTRUCTION

4.1 Master's Degree

Students pursuing the Master of Statistics degree may choose a collection of required courses we currently call ‘concentrations’ to tailor their training toward specific objectives. At the time of this writing, these concentrations are merely names of degree requirements; a proposal to make these ‘Concentrations’ in the Graduate School sense, that the designation appear on a student’s transcript, is working its way through the system. All of the concentrations require the same total hours required (34) and the same core statistics requirements: ST512(Stat Methods II), ST521&522 (MathStat I & II), ST552(Linear Models), and ST641(Consulting) – for a total of 13 hours, as ST641 is a one hour course and the others are the usual three hours.

<table>
<thead>
<tr>
<th>Concentration</th>
<th>Requirements in addition to ST 512, 521, 522, 552, 641, passing the Basic Exam and Master's Final Oral Exam</th>
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</table>
| Master of Statistics (no concentration) | • ST711 (Design), ST715 (Sampling)  
|                                | • either ST744 (Categorical) or ST745 (Survival)  
|                                | • Statistics Electives (3 hours)  
|                                | • Supporting Electives (9 hours)                                                                 |
| Biostatistics Concentration   | • ST520(Clinical Trials, ST711(Design), ST744 (Categorical)  
|                                | • either ST732 (Longitudinal) or ST745 (Survival)  
|                                | • Supporting Electives (9 hours)                                                                 |
Environmental Statistics Concentration

- ST733 (Spatial)
- Statistics Electives (9 hours)
- Supporting Electives (9 hours) – constituting a minor or a split minor

Mathematical Statistics Concentration

- ST758 (Computing), ST779(Probability), ST793(Adv Inference)
- Statistics Electives (12 hours)

Statistical Genetics Concentration

- One of ST711(Design), ST715(Sampling), ST744(Categorical), ST745 (Survival)
- Three of the following ST721(Genetic Data Analysis), ST590A(Bioinformatics), ST590C(Bioinfm II), GN703(Pop & Quant Genetics), ST/GN756(Comp Molec Evolution), ST/GN757(Methods Quant Trait Loci)
- Statistics Electives (3 hours)
- Supporting Electives (6 hours)

Financial Statistics Concentration

- ECG528 (Asset Pricing), MA547(Financial Math)
- One of ST730 (Applied Time Series), ST782(Time Series-Time Domain), ST/ECG751(Econometrics), ECG/MA766(Financial Computations)
- One of ST715(Sampling), ST740(Bayesian), ST744(Categorical)
- Statistics Electives (9 hours)

In the table above, a Statistics elective is any course listed or cross-listed as an ST course at the 500 level or above, excluding required (core) courses and introductory statistical methods courses. Supporting electives include Statistics electives and courses in other departments at the 400-level or above.

In recent years, the most common routes for Master of Statistics students entering the workforce are Biostatistics and ‘No concentration;’ while the majority of students completing the Master of Statistics en route to a PhD in Statistics choose the Mathematical Statistics concentration. Over the last 4 years, only 3 master’s students have chosen a minor.

The Statistical Genetics concentration was revised in Fall 2011. The Financial Statistics concentration was adopted in Fall 2011. These two concentrations are also the only ones that depend on other departments for required courses or restricted electives. The Statistical Genetics concentration includes two cross-listed courses ST/GN756,757 that are not usually taught by Statistics faculty, as well as GN703 (Quant & Pop Genetics). The Financial Statistics concentration includes two required courses taught outside of Statistics: MA547 (Financial Math) and ECG528 (Asset Pricing), with the latter recently taught by Math, as well as prominent electives ST/ECG751 (Econometrics) and ECG/MA766. At present, we have little experience
with problems arising from the teaching of courses outside of our control, as, until the recent
revision, the Statistical Genetics route was not usually pursued by Master of Statistics students,
and the Financial Statistics concentration is yet to be tested.

Students pursuing a Master of Statistics degree must also pass a qualifying examination known
as the Basic Exam, given in August and January of each year. Questions on the exam range over
the material covered in the core courses: ST512 (Methods), ST521,522 (MathStat), and ST552
(Linear Models). Students must pass at the Master’s level to earn a Master’s degree; a pass at
the PhD level is required to pursue the doctoral degree.

The Department of Statistics also offers a Master of Science degree whose requirements are
similar to those of the Master of Statistics degree. The Master of Science degree requires a
thesis, and six hours of research ST695 replaces six hours of electives. However, only two
students have earned this degree within memory (35 years), although one was in 2011.

Both Master of Statistics and Master of Science students must also pass an Oral Exam, usually
scheduled during the student’s final semester. The exam usually begins with a simple statistical
problem in everyday life from which probing questions assess the student’s understanding of
statistical fundamentals and their ability to ‘do statistics on their feet.’ We have considered
eliminating this exam from time to time but as yet we have not found an appropriate substitute.

Starting in Summer 2013, we will teach some of the core courses (ST512, ST521) during the
summer. With this change, students would be able to complete the Master of Statistics program
within one calendar year without any changes in requirements. We have begun advertising this
program, and anticipate applications for Summer admission to the program. Between the writing
of this document and the Review in January 2013, we will have a better idea of the viability of
this One Year Master’s program.

As we introduce on-line versions of service courses, such as ST311, ST511, etc., the step to on-
line graduate courses is a natural one, and prompts envisioning a new educational paradigm.
While trying to tackle the immediate hurdle of teaching theory courses (e.g. ST521, 522) in an
on-line format, we are currently investigating the viability of a completely on-line Master of
Statistics program.

4.2 Doctoral Degree

Students entering the doctoral program are expected to have a good foundation in the material
covered in the core courses of our Master’s program (ST512, ST521, ST522, ST552), even if the
Master’s degree was received at another institution. In fact, these courses form the basis for their
first qualifying examination, the Basic Exam, and students need a PhD level pass to continue in
the doctoral program. Students arriving with a Master’s degree from another institution take a
varying fraction of these core courses upon arrival, depending on the quality of the previous
institution. Students beginning the program from a baccalaureate degree are not required to gain
a Master of Statistics en route to their doctorate. While many students choose to do so, the
numbers may depend more on timely prodding by the DGP. Few students (two in the last 4
years) choose a minor field of study at the doctoral level.

The required coursework for a Doctor of Philosophy in Statistics consists of the following:

- **Core Courses**
  - Advanced Probability (ST779)
  - Advanced Statistical Inference (ST793)
  - Computation for Statistical Research (ST758)
  - Core Options: one course, currently offered as ST 790, from the following
    - Asymptotic Statistics
    - Advanced Bayesian Methods
    - Modern Nonparametric Methods
- **ST841: Statistical consulting (unless student has taken ST641 in our department)**
- **Ethics sequence: Ethics in Statistics (currently offered as ST810-004) and PHI 816 Research Ethics. These partial-semester courses are designed to be taken together.**
- **6 hours of statistics Ph.D. electives are required from the following list**
  - ST740: Bayesian Inference and Analysis
  - ST746: Stochastic Processes
  - ST762: Nonlinear Statistical Models
  - ST782, ST783: Time Series Analysis
  - ST784: Multivariate Analysis
  - Additional Core Option courses
  - Approved special topics courses
- **3 hours of supporting electives**

Students are strongly encouraged to take ST810 “Preparation for Research” before taking the written prelim exam. Once a student has identified a research advisor, he/she may register for research credit hours (ST895) with the consent of the advisor.

Students must complete the PhD core courses (ST 758, 778, 793) before taking the PhD Preliminary Written Exam. The main content of the Exam will be a 20 page report prepared by the student without outside help during a one month period. The topic will be assigned to the students by the Prelim Committee. The topic will be chosen from one broad area that the student will choose from a list of broad areas in statistics. In addition, the students will conduct and report on a simulation project along established guidelines. Also, the committee may ask for the student to make a presentation at which time they can question the student about the work. Students should take the Ph.D. preliminary written exam after having achieved a PhD pass on the Basic Exam and during the summer following the completion of the Ph.D. core courses.

For a co-major at the doctoral level, students are required to take the Master’s core (ST512, ST521, ST522, ST552, ST641/841) as well as most of the PhD core (ST758, ST778, ST793). In addition, one key Master’s level elective (ST711 Design, ST715 Sampling, ST744 Categorical) is required. While the PhD Preliminary Written Exam is not required for PhD co-majors, students must attain a PhD pass on the Basic Exam.
The requirements for a doctoral program must balance the inclusion of the fundamental tools of
the discipline without overly delaying the progress of a student to the frontier of research. In the
last revision of the doctoral program, we reduced the probability requirement from two semesters
to one. This reduction allowed the inclusion of a computing course (ST758). The inference
requirement was similarly reduced following the understanding that the discipline of Statistics is
broadening. To accommodate this change, three courses, known as Core Options, were
introduced: Asymptotic Statistics, Nonparametric Regression and Smoothing, and Advanced
Bayesian Methods. Currently, these courses are being taught as ST790 Special Topics.
This broadening of the field of Statistics has accentuated the role of our Special Topics courses
in introducing students to new ideas and current research areas of Statistics. In the past, many of
our upper level courses were bringing our students within sight of the frontiers of the field. But
as the field has matured, these courses can no longer serve that role. Our ability to offer several
courses in new research areas will be critically important to the continued success of our doctoral
program. At times in recent years, because of faculty teaching loads and other commitments, our
students have had few choices available.

4.3 Instructional Relationship to Other Programs

Many graduate students in other programs choose to minor in Statistics: 81 at the Master’s level,
28 PhD over the last four years. Economics students lead with 19 overall, followed by Fish &
Wildlife (15), Forestry (10), and Textiles (10) with 25 programs represented in all. A minor in
Statistics at the Master’s level requires only three courses; at the PhD level, six courses are
required, including both theory and applied sequences.

Some statistics service courses are required by other graduate programs. The most commonly
required course is ST511, by programs in the College of Agriculture & Life Sciences as well as
the College of Veterinary Medicine and Industrial & Organizational Psychology. A few other
programs (e.g. Crop Science, I/O Psych) also require ST512. Some economics programs also
require the MathStat sequence: ST421,422.

Many courses are also cross-listed with other programs with which the department has had long-
standing relationships. The strong relationship with Genetics is manifested in cross-listed
courses ST721, ST756 and ST757. The Bioinformatics program lists its two core courses as
special topics courses in Statistics (ST590). The core Biomathematics sequence is cross-listed as
ST771, ST772, ST773. Four econometrics courses (ST750-753) show the relationship with
Economics. Courses in probability and stochastic processes are shared with Mathematics
(ST546, ST746, ST747, ST748). Other cross-listed courses include ST706 (Operations
Research) and ST506 (Zoology).

4.4 Curricular Changes

Perhaps the biggest change in the curricula since the last review is the streamlining of the PhD
requirements. We reduced both of the required probability and advanced inference sequences
from two courses to one course each. In their place, we required a modified doctoral-level
statistical computing course (ST758), and one of three ‘core options:’ Asymptotic Statistics,
Advanced Bayesian Methods, and Modern Nonparametric Methods. These Core Options are currently taught as ST790 Special Topics courses. The motivations for these changes were twofold: first, computational skills have become essential for any area of statistical research, and, second, as the field of statistics has broadened, the common core has shrunk, and these emerging fields are current areas of research activity.

The second major change since the last review is with the first qualifying exam. In the 1990’s the Basic Exam was split into two exams (Master’s and PhD Qualifying exams) with the intention of tailoring the exams better. This approach did not have the desired effect and was viewed as duplication of effort. Since the last review, we reestablished the Basic Exam with two pass levels: Master’s and PhD. Also in that time period, we targeted our recruiting more toward doctoral students, and, perhaps, raised the admissions bar for the fewer Master’s students that were admitted. Some faculty hold that the quality of students has improved, and with it the success rate on the Basic Exam.

The most recent change is the addition of an ethics requirement, motivated both by controversies in the field of Statistics, as well as ethical issues arising in other areas of science.

4.5 Professional Development Opportunities

The primary opportunity for graduate students to teach is the large ST311 course. In its current format, much of the lecture material is available online and graduate students teach the weekly lab/recitation sessions. The TA’s spend two days in training at the beginning of each semester, and meet for an hour each week with the course coordinators. The only courses where graduate students shoulder full teaching responsibilities are ST312, the night section of ST311, and, on occasion, ST371, 372 in the summer. Two other courses have lab sessions run by TA’s: ST350 and ST512. Some of our graduate students participate in two NCSU programs: Preparing for Professoriate and Certificate of Accomplishment in Teaching (CoAT).

As doctoral students approach the Written Preliminary Exam, they are encouraged (but not required) to take ST810A Preparation for Research. The role of this course is to formally present material that some students learn on their own. The material for this course has been in constant flux as certain topics have been targeted, with simulation now included in ST758 and ethics expanded to a new, required, two credit offering.

The department also encourages graduate students to participate in local, regional, and national symposia and conferences. Many students first present their research at the NCSU Graduate Student Symposium. More polished research is presented at either the Biometrics ENAR conference or the Joint Statistics Meetings. Between those two conferences, more than 20 students may present their work. If the student is not supported by a grant or a travel award, the department provides travel funds for students to present their work, with a more modest amount for just attending the conference.
V. ASSESSMENT OF OUTCOMES/FACULTY EXPECTATIONS

5.1 Summary of Past Biennial Assessment Reports

At the time of the previous biennial assessment, some progress had been made on issues raised in the last review. The size of the program has leveled off; some faculty have been hired in active research areas.

One issue raised in the last review and addressed in the past biennial report was problems with the PhD qualifying exam. As described in Section 4.4, the Basic Exam was reestablished.

Another issue addressed in the past biennial report is the communication of information to and from the DGP’s and students. In response, the DGP’s instituted an annual progress report. While occasionally the progress report was done semiannually, we are settling on an annual report. Current work is in progress to automate more of this activity to make information easier to provide for the faculty and DGP’s, and the collection of information from the students (awards, papers presented, support/TA preferences, etc.) easier and more effective.

5.2 Summary of Current Assessment Report

A few years ago we implemented a seminar attendance requirement. After some initial problems (including requiring too many), we have set the requirement at 15 for the year. Looking at the seminar attendance records for the past two years, we see that most of the students (60%) are complying as well as could be expected. The seminar policy seems to be working from the perspective of enforcement. We would like to see whether this is leading to doctoral students beginning the research phase earlier. In addition, discussions at recent faculty meetings have led to plans for improving the quality of the seminars and their accessibility for the students.

In assessing our recruiting program, we compared the number and quality of applications for the past two years. While the number of applications dropped slightly, both the verbal and quantitative GRE scores improved, by 30 and 10 points, respectively. Since the variance in the quantitative scores that we see is so small, both of these improvements are significant. Our improving quality of applications may be the result of recent publicity of high rankings of the department.

We examined the placement of our doctoral graduates for the past five years. The yearly trends are interesting.

<table>
<thead>
<tr>
<th>Year</th>
<th>Industry/Govt</th>
<th>Academic</th>
<th>Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006-07</td>
<td>16</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2007-08</td>
<td>11</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>2008-09</td>
<td>9</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>
The department has had a reputation for producing doctoral graduates for industry; the last year's placement of students in academia is surprising. We have observed a shift in the placement of doctoral graduates from predominantly industry jobs to more academic jobs. However, we must wait for a full economic to see if that shift is merely a response to the job market, or the result of changes in our curriculum. Placement of graduates in highly competitive academic positions may signal improved quality, but since the department has a proud history of strength in applied statistics, a shift to a more theoretical direction to the department may not be in its long term best interests. We should wait for changes in the economic climate -- perhaps another year or more -- to see if market forces explain the changes in doctoral student placement.

As we have just now fully implemented changes in the doctoral curriculum from three years ago, we discussed this curriculum at this year's faculty retreat. In particular, we discussed whether some of the core courses, especially Advanced Inference, were staying up to date. Suggestions from the faculty were collected by the Course and Curriculum Committee for further action.

The introduction of progress reports has been successful in helping DGP's track students through the system. Changing to annual (from semi-annual) student progress reports has dropped the overall workload, but we feel a more careful processing of these reports can flag potential problems such as NC residency, GSSP limits, and delays in doctoral research progress. We will see if more careful processing leads to fewer problems arising in the coming year.

Past pressures on the graduate program have pushed us to focus our recruiting toward the doctoral program, with master's students an afterthought. Changes in summer funding may make a one-year Master of Statistics program attractive to students and viable within the teaching capabilities of the department. We are seriously considering expanding the Master's program and recruiting for an incoming class in the Summer of 2013. We will need to make a decision within the next month (July) on that effort.

VI. CURRENT RESEARCH

6.1 Current Research

The NC State Statistics Department is large with research strength in many areas. Some of the most obvious areas with multiple faculty in each are biostatistics, spatial and environmental statistics, model selection and sparse inference for high dimensional problems, statistical genetics and bioinformatics, and statistics education. In terms of national prominence, we should mention the NIH PO1 grant joint with Duke and UNC-CH, the environmental network training grant with many national partners (STATMOS), the Center for Quantitative Sciences in Biomedicine (CQSB), and 3 currently active NSF CAREER Awards. The chancellor's cluster hire program is fueling new strength in bioinformatics, personalized medicine, forensics, and
analytics.

6.2 National Comparison

In terms of focus areas and breadth of coverage, the department is very competitive with other statistics departments. We have strong working groups in many areas, and we are developing new expertise through the cluster hires in emerging areas like bioinformatics, forensics, and personalized medicine. The following list gives an idea of the research interests of the faculty.

<table>
<thead>
<tr>
<th>Assistant Professors</th>
<th>Research Interests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arellano, Consuelo</td>
<td>Statistical Consulting</td>
</tr>
<tr>
<td>Griffith, Emily</td>
<td>Sampling Animal Populations, Spatial Statistics</td>
</tr>
<tr>
<td>Jeng, Xinge (Jessie)</td>
<td>High-Dimensional Inference, Multiple Testing, Model Selection, Bioinformatics</td>
</tr>
<tr>
<td>Laber, Eric</td>
<td>Nonregular Asymptotics, Dynamic Treatment Regimes, Machine Learning</td>
</tr>
<tr>
<td>Maity, Arnab</td>
<td>Semiparametric Methods, Measurement Error, Longitudinal Data</td>
</tr>
<tr>
<td>McGowan, Herle</td>
<td>Statistics Education, Educational Research Methodology</td>
</tr>
<tr>
<td>Reich, Brian</td>
<td>Environmental Statistics, Bayesian Statistics, Hierarchical Models</td>
</tr>
<tr>
<td>Song, Rui</td>
<td>Statistical learning, Semiparametric Inference Empirical process applications, Dynamic Treatment Regimens</td>
</tr>
<tr>
<td>Staicu, Ana-Maria</td>
<td>Functional Data Analysis, Biostatistics, Conditional Inference</td>
</tr>
<tr>
<td>Zhou, Hua</td>
<td>Statistical Computing, Statistical Genetics, Stochastic Processes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Associate Professors</th>
<th>Research Interests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bondell, Howard</td>
<td>Variable and Model Selection, Robust Inference</td>
</tr>
<tr>
<td>Gross, Kevin</td>
<td>Biomathematics, Mathematical Ecology</td>
</tr>
<tr>
<td>Li, Lexin</td>
<td>Dimension Reduction, Bioinformatics, Machine Learning</td>
</tr>
</tbody>
</table>
Lu, Wenbin  
Survival Analysis, Longitudinal Analysis, Statistical Genetics

Martin, Donald E. K.  
Distribution of Patterns in Random Sequences, Time Series

Moore, Renee  
Biostatistics, Statistics Education, Longitudinal Data Analysis, Clinical Trials, Applications in Medicine and Psychology

Motsinger-Reif, Alison  
Computational Genetics, Pharmacogenetics, Epistasis

Osborne, Jason  
Microarray Analysis, Agricultural Applications, Nonparametric Smoothing

Reiland, Thomas  
Statistics Education, Statistics in Sports, Distance Education

Schwartzman, Armin  
Statistical Signal and Image Analysis, False Discovery Rate, Applications in Neuroimaging and the Environment

Smith, Charles (Charlie)  
Neurobiology, Stochastic Processes, Physiological Models

Tzeng, Jung-Ying  
Statistical Genetics

Wang, Huixia (Judy)  
Quantile Regression, Bioinformatics, Mixed Models, Longitudinal Data Analysis

Weems, Kimberly  
Statistics Education, Measurement Error Models

Woodard, Roger  
Statistics Education, Bayesian Statistics, Spatial Statistics

Wu, Yichao  
Longitudinal Analysis, Machine Learning, Model Selection

Zhang, Hao (Helen)  
Model Selection, Machine Learning, Nonparametric Smoothing

Full Professors  
Research Interests

Bloomfield, Peter  
Time Series, Statistical Models for Finance

Boos, Dennis  
Model Selection, Resampling Methods, Biostatistics

Davidian, Marie  
Biostatistics, Longitudinal Analysis

Dickey, David  
Time Series

Fuentes, Montserrat  
Environmental Statistics, Spatial Statistics, Spectral Methods

Ghosh, Sujit  
Bayesian Inference, Spatial Statistics, Survival Analysis
Although all national comparisons and rankings have flaws, for illustration we present below a graphic showing how our department fared in the National Research Council (NRC) rankings based on data collected in 2006-2007. A brief explanation of the rankings maybe found in


In particular, we quote from that article:

“S-rankings are derived by comparing individual programs’ characteristics with the characteristics that scholars in the field say they value. For example, if political scientists say that citation rates are the most important measure of a program’s quality, programs that have high citation rates will do well in the S-rankings game. R-rankings are derived by comparing individual programs’ characteristics to faculty members’ opinions of a sample of programs in the field. For example, if political scientists say that Harvard, Wisconsin, and
Berkeley are the three strongest programs in their field, then programs that are objectively similar to those three will do well in the R-rankings game.”

The graph below is the ellipse plot showing the R rank (vertical axis) and the S rank on the same plot. NC State is ranked especially high in the R dimension, where the 95% confidence interval of the rank is approximately 3 to 12.

6.3 Interdisciplinary Projects

There are a substantial number of departmental programs and associations that lead to interdisciplinary research. Here are a few:

a. Two faculty members in the department, Charlie Smith and Kevin Gross, are core members of the Biomath Program, which by its very nature is interdisciplinary. More about this program is given in Section 10.

b. The Statistical Genetics group within the department has four faculty members (Alison Motsinger-Reif, Spencer Muse, Jung-Ying Tzeng, Zhao-Bang Zeng), also members of the Bioinformatics Research Center, work on collaborative projects with other statistics faculty and also direct theses of Statistics Ph.D students. Dr. Muse also
has an NIH training grant that supports students in the department. More about this
group is given in Section 10.

c. The Biostat working group in the department has associations with medical
researchers at Duke, UNC-Chapel Hill, and other institutions. For example, Marie
Davidian and Butch Tsiatis are adjunct Professors in the Department of Biostatistics and
Bioinformatics at Duke University and collaborate with medical investigators and other
statisticians at the Duke Clinical Research Institute (DCRI). Marie Davidian has an NIH
training grant that places our students at the DCRI. In addition Dr. Davidian is a co-pi on
an NIH P01 grant (“Statistical Methods for Cancer Clinical Trials”) that is joint with
Duke and UNC-Chapel Hill and includes many of our faculty as investigators. Recently,
they sponsored the IMPACT Conference held in downtown Raleigh,
http://impact.unc.edu/impact/Symposium2012, that attracted many participants (over 70
in the opening workshop).

Marie Davidian is founding Director of the NCSU Center for Quantitative Sciences in
Biomedicine (CQSB), which was chartered in 2007 as a focal point on campus to bring
together quantitative and biomedical/biological scientists from both on and off campus to
address challenges at the interface of these two areas. Over its five year history, CQSB
has fostered numerous such projects through generous support from the university and
has attracted significant research funding from NIH.

d. The Environmental working group has many interdisciplinary projects. Recently, they
hosted the ASA ENVR workshop http://community.amstat.org/WOE/Home/ Montse
Fuentes is the director of the Exposure Modeling research branch of the Center for
Human Health and the Environment (CCHE, a center at NCSU). The goal of CHHE is to
understand and prevent the adverse impacts of environment factors on human health,
particularly for those people living in rural and agricultural communities. Dr. Fuentes has
also been working with the environmental exposure modeler Chris Frey and with
scientists at EPA as well as on NIH funded research environmental health projects. The
new Research Network for Statistical Methods for Atmospheric and Oceanic Sciences
(STATMOS) is an exciting new initiative to give multidisciplinary training to statistics
graduate students and post-docs (http://www.statmos.washington.edu/members.html).

e. Many of our students work in half-time positions in RTP for companies like
GlaxoSmithKine and Quintiles as part of their graduate training. These are graduate
assistantships through the department that provide tuition and pay similar to TA
positions. We call them GITs for Graduate Industrial Traineeship. The GIT program has
been a win-win-win program as students, companies, and the Department all benefit from
various interdisciplinary and collaborative research work. For many of our graduates,
having long-term work experience makes their resume stand out. The experience also
helps the student to evaluate the type of position they want to pursue. These industrial
collaborations arise through contact with the co-DGP (Sujit Ghosh), who also serves as
the faculty supervisor for GIT-appointed students. The PAMS Foundation at NCSU has
been a great partner with this GIT program and has helped the department in establishing
the contracts between the university and the companies. The program has generated over
a couple of million dollars in student support over the past 5 years.

f. The department has a long history of collaborative associations with the College of Agriculture and Life Sciences (CALS). CALS financially supports a number of positions in the department, but primarily Consuelo Arellano and Jason Osborne who have hundreds of face-to-face meetings each year with CALS faculty and graduate students, and we teach many of their students in graduate methods courses. The statistical consulting course, ST 641, pairs students in the course with members of CALS who need statistical help. Many departmental faculty help with these teams. We have just hired a new faculty member, Emily Griffith, to be our main contact with the Vet School and who will consult and collaborate with their faculty and students. This new initiative should provide a new avenue for interactions with a top Veterinary Program.

g. The department encourages interdisciplinary research through our masters of statistics concentrations in Biostatistics, Environmental Statistics, Statistical Genetics, and Financial Math.

h. Individual faculty in the department have collaborative relations with members of departments on campus (outside CALS). For example, Judy Wang has collaborated with NCSU researchers from MEAS, College of Veterinary Medicine, Department of Forestry and Environmental Resources. Montserrat Fuentes has collaborated with faculty from MEAS and Civil and Environmental Engineering. Brian Reich has funded collaborations with NCSU faculty Don Brenner (Material science), Beth Gardner (Forestry), and Francois Birgand (Biological and Agricultural Engineering). David Dickey has collaborated with the Institute for Advanced Analytics from its inception. Wenbin Lu has worked with Dr. Mo-Yuen Chow from Department of Electrical and Computer Engineering. Howard Bondell has worked regularly with faculty and graduate students in the Department of Fisheries and Wildlife.

i. Faculty are involved with institutions in RTP. For example, Judy Wang has been collaborating with scientists from EPA, postdoctoral fellows from SAMSI and NISS. Montserrat Fuentes has a long history of collaborating with EPA scientists. Brian Reich has also worked with scientists at the EPA in toxicology and exposure science.

j. The department is involved in four of the Chancellor's Faculty Excellence Program interdisciplinary research clusters. 1) Marie Davidian is the cluster coordinator for the NCSU Faculty Cluster for Personalized Medicine Discovery. The cluster brings together investigators in statistics, applied mathematics, industrial and systems engineering, and clinicians to pool expertise to develop approaches to identifying optimal treatment strategies. 2) Len Stefanski, Peter Bloomfield, and Sujit Ghosh are serving on a search committee for a forensic statistician, a position that was created in the Faculty Cluster for Forensics. The statistician will interact with NCSU's recently formed Forensic Sciences Institute, which focuses on innovative interdisciplinary research and educational programs. 3) Dave Dickey has been involved with the Data-Driven Science Cluster. 4) All four of the Statistical Genetics group are involved with the Bioinformatics Cluster.
6.4 External Research Support

The faculty in our Department continue to be extremely successful generating external funds to support our graduate students and the Department’s research initiatives. Last year we generated $5,463,147 in direct costs; this amount is very representative of the external research support funds brought to our Department every year. The majority of the grants are funded by NIH although our faculty are also very successful with NSF initiatives. We currently have 3 NSF CAREER awards in our Department. We also have three NIH training grants, two NSF training grants (S-STEM and CUSP), and about half a million dollars (direct cost) are generated through GIT’s every year. In the table below we include the expendable amounts coming to our Department every fiscal year through grants. The GIT’s are not included in the total amount. Training grants are part of the total; most of the training grants are funded by NSF or NIH.

**Direct Funds Acquired in Statistics**  
**2007-2008 to 2011-12**

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>NIH</th>
<th>NSF</th>
<th>Other</th>
<th>Total of All Grants</th>
<th>Training Grants</th>
<th>GIT’s</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007-2008</td>
<td>$2,181,454</td>
<td>$1,534,734</td>
<td>$317,277</td>
<td>$4,033,465</td>
<td>$288,830</td>
<td>$433,630</td>
</tr>
<tr>
<td>2008-2009</td>
<td>$2,310,867</td>
<td>$1,323,681</td>
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</table>

6.5 Research Development

Our efforts in Item 6.3 above list many relationships with faculty on campus. We try to encourage these collaborations whenever possible. We do not have any deficiencies in facilities and technical resources (like computers) that impede research.

6.6 Ethics Training

We had been teaching ethics as part of a special topics course (Preparation for Research, ST810A) that was not mandatory. However, several training grants with NIH require more formal ethics training and there seems to be an emerging national consensus to provide more ethics training. So recently, we voted to require Ph.D students to take two 1-hour courses that each meet 2 hours per week for half of the spring semester (the philosophy course below is in the first half, followed by the new Statistics course):

a. Philosophy 816, Introduction to Research Ethics. The catalog description says:
Institutional rules guiding the responsible conduct of research (RCR) and their philosophical justification. Rudiments of moral reasoning and their application to RCR. Topics: plagiarism, falsification and fabrication of data, and ethics versus custom, law, science, and religion.

Details may be found at the course website:
http://openseminar.org/ethics/courses/29/index/screen.do

b. Statistics course (currently taught as a special topics course), Ethical Guidelines for Statistical Practice

Catalog Description: Discussion-based course exploring the ethical and professional practice of statistics, following the guidelines provided by the American Statistical Association. Topics will include data integrity and falsification; abuse and misuse of statistics; objectivity; authorship and intellectual property; clinical trials and research subjects.

Spencer Muse has already offered this new course once, and will continue to develop it.

VII. SERVICE/OUTREACH EXTENSION

7.1 Consulting

See Section 11.2 for a description of current on-campus consulting and Section 9.2 for plans to expand departmental consulting.

7.2 Community Service/Extension/Engagement

A. Service to Professional Organizations

The department has a strong commitment to the American Statistical Association (ASA) and other professional organizations. Many faculty are Associate Editors of journals and have committee responsibilities to these organizations, but there are too many individuals to list all their contributions. Here we list some of the most prominent ones to illustrate the department’s involvement. Sastry Pantula was president of the ASA in 2010, and Marie Davidian will be president in 2013; Sastry Pantula is currently Director of the Division of Mathematical Sciences at NSF (the first statistician holding this position over all math sciences); Len Stefanski was Editor of the Journal of the American Statistical Association 2008-2011; Marie Davidian has been the Executive Editor of Biometrics for the last five years and a founding co-pi and co-director of the Summer Institute for Training in Biostatistics (SIBS), an outreach program to attract American students to careers in biostatistics; Butch Tsiatis has been Editor of Biostatistics since 2010; Montserrat Fuentes has been Editor of Journal of Agricultural, Biological, and Environmental Statistics since 2010 and is also chair of the ASA Statistical Computing Section; Subhashis Ghosal is the current Editor of Sankhya, the Indian Journal of
B. Service to Other Institutions

Montse Fuentes is on the Committee on Applied and Theoretical Statistics, National Academy of Sciences; Butch Tsiatis is on the Scientific Advisory Board for Quintiles and will serve on a newly formed Data Safety Monitoring Board for prevention trials in HIV research; several faculty have been consulting with the U.S Environmental Protection Agency (EPA) for many years; others have consulted with local and national companies like GlaxoSmithKline, Research Triangle Institute (RTI), Abt Associates, Merck Research Laboratories, Talecris Inc., CDC, Agri-Analytics, and Meso Inc. One faculty member has been consulting with the State of North Carolina on Medicaid Fraud cases; recently another consulted with important NC legislative members about the NC Lottery;

Bill Hunt and the undergraduate students he mentors have provided technical assistance to the North Carolina Department of Environment Natural Resources (the Air, Water and Toxic Divisions); the New Jersey Department of Environmental Protection; the Maryland Department of the Environment; the USEPA – the Chief Statistician, the Office of Air Quality Planning and Standards – the Air Quality Assessment Division, the Health and Environmental Impacts Division and the Sector Policies and Programs Division; the Office of Research and Development; the NC State Climate Office; and NCSU’s Marine, Earth and Atmospheric Sciences Department.

C. Training Outreach

Individual faculty often give short course at national meeting and at companies. However, our largest impact will likely be through the growing number of online/distance courses that we make available to students all over the world.

7.3 Graduate Student Involvement in Community Service/Extension/Engagement

The graduate education provided by the Department of Statistics is general in scope and not intended to prepare the student for a specific industry. On the other hand, in response to advances in the discipline, courses and curriculum tracks are available that cover methodology useful in research problems dealing with biomedical, environmental, financial statistics, and statistical genetics.

The innovations originating in the department have contributed to advance the other sciences at NC State through its teaching, consulting, and interdisciplinary research. The department has contributed to the growth of local companies through statistical innovation, well-trained graduates, and through its traineeship programs. For many years, the Department of Statistics has been training graduate level statisticians who often contribute to needs of the State. Those choosing to apply their knowledge to the area of agriculture contribute by improving the State’s agricultural research programs through use of better experimental designs and through proper analysis of results. The Department appoints a graduate research assistant to serve various
consulting needs of CALS departments on campus and other clients from State of NC agencies. Those choosing to pursue academic careers contribute by teaching and carrying out research in statistics at various public and private colleges and universities in the State. Graduates of the Department are particularly well trained for jobs in North Carolina found in the pharmaceutical and biomedical industries.

Graduate students are actively involved and engaged in campus life through participating in athletics (organized or intramural), extracurricular activities and student organizations (http://ncsu.orgsync.com/). Students often volunteer to mutually benefit the campus and the community through various one-time, short-term, and long-term community service projects (e.g., Packapalooza, Toys for Tots, etc.). A good part of the outreach activities of the university graduates are organized by the University Graduate Student Association (USGA, http://ugsa.ncsu.edu/). Students from the Department routinely serve as active members of the Statistics Chapter of USGA. Within the Statistics Department, the Graduate Student Association (GSA) has appointed officers to help with many cultural and community activities (e.g., weekly sporting events, fall beach trip, international dinner, and spring picnic). The department provides travel funding to students for attending and presenting their scholarly work at national and international conferences and also for doing volunteer work at these forums. Statistics graduate students started the NC State chapter of SACNAS.

VIII. ACCREDITATION

This does not apply to our Department.

IX. SUMMARY COMMENTS AND VISION FOR THE FUTURE

2.4 Summarize the major strengths and weaknesses of the graduate program and the challenges and opportunities it faces in the foreseeable future.

The Statistics graduate program at NC State is one of the largest, oldest, and best in the nation and is regarded as one of the top 10 graduate programs. Students are doing cutting edge research at early stages of their career in collaboration with our faculty and with scientists on campus and around the Research Triangle area. We will continue to prepare our students to succeed in today's multidisciplinary work environment.

Our Statistics graduate program has always worked to balance innovation with time-honored core training in applications and theory. Currently there are plans to launch a new one-year MS program to go along with the current 2-year MS degree concentrations in financial statistics, statistical genetics, biostatistics, environmental statistics, and mathematical statistics. In addition we are adding online courses in core courses with an eye to having an online masters degree. Bringing new technology to instruction has been a strength of our program and helps with efficiency while enhancing the learning experience for our students.
We have pursued a very proactive recruitment of minority students and faculty that has led to the current diverse group. The Department has been recognized by AMS as a department ‘making a difference’ in terms of diversity. We provide a very supportive climate in our Department for both students and faculty. Concrete evidence of that support is provided by a new University-wide leave policy for graduate students (NCSU REG 02.15.08) and a new Department family workload reduction policy for faculty (included at the end of this Section).

One of the main challenges ahead of us is facilitating and promoting interdisciplinary degrees involving statistics at NCSU. Statistical research is inherently multidisciplinary, and we should continue promoting strength in our core while exploring connections with other fields. Another significant challenge for all graduate Statistics programs is the training of students to help them succeed in the new era of science dominated by Big Data problems. We should integrate more computational and data-enabled science into our curriculum; for example, working with large data bases, clever visualization techniques, and uncertainty quantification.

**Statistics Department Guiding Principle for Workload Reduction Plan**

The Department of Statistics is committed to promoting a family-friendly work environment and recognizes that there are many family-related events that affect the balance between work and family life. As a result, the Department has adopted a Workload Reduction Plan with continuation of salary for the purpose of providing a temporary adjustment in faculty members’ workload to accommodate family-related events. This Plan provides an extended option for faculty members to manage their professional and family responsibilities and complements the University’s leave policies. Under this Plan, full-time faculty members who are appointed to a tenured, tenure-track, or non-tenure track position are eligible to receive one course reduction. The course reduction will run concurrently with any leave provided under the Family and Medical Leave Act (FMLA) and Medical and Parental Leave for 9-Month Faculty. Should leave taken under either FMLA or Medical and Parental Leave for 9-Month Faculty extend across two semesters, the faculty member has the option of taking the course reduction during the semester in which the family matter occurred or in the subsequent semester.

The Workload Reduction Plan covers family-related matters that require temporary, but intensive attention of a family member. Should a faculty member and his/her spouse or domestic partner both be eligible for a work-load reduction under this Plan, either one, but not both, may take the course reduction.

For twelve-month EPA employees, the workload reduction applies only after the employee has used the lesser of one-year’s worth of sick leave or his/her accumulated sick leave.

Related University Policies:

- Medical and Parental Leave for 9-Month Faculty, [http://policies.ncsu.edu/policy/pol-05-30-01](http://policies.ncsu.edu/policy/pol-05-30-01)
2.5 Briefly describe the program's vision/strategic plan for the immediate future:

Our research and training should focus on addressing and solving high level problems of national interest that tend to be multidisciplinary, rather than incremental research that increases small variations of existing research. *This is consistent with the NCSU strategic planning.*

We should promote the training of our students to work on research at the intersection of life sciences, environmental science, computer science, and statistics.

We should include more training in computational and graphical statistics and emphasize the important role of computational and data-enabled sciences in the modern research environment.

We should promote, encourage, and facilitate reproducibility of scientific research and open access to data and software as an essential component of our research and training.

We plan to continue involving undergraduates in research. This will enrich their training and help motivate them to continue their education.

As stated in our mission, our Department is committed to offering the highest quality of consulting and service to our campus community. We seek to grow our consulting efforts, currently supported entirely by CALS, to be more inclusive of other colleges on campus. In particular, we plan to enlist support from the new College of Science (COS) to form a consulting center with a position for a new director committed to increase and facilitate our service across campus.

Statistical training through online courses and degrees is rapidly increasing, both locally, across the state of NC, and nationally as well as internationally. For a number of years, the Department has been introducing new online courses, but the time has come to take a much more aggressive approach. In particular, the addition of an online masters program is the next step and is a high priority in our vision for the future. This initiative will require special financial support to facilitate the involvement of our faculty in the development of these courses, as well as for the student recruitment effort, and to provide the tech support essential for the success of this initiative.

The Department is being stretched to continue providing the quality (and quantity) of training that defines our program: mentoring of students, service to the profession and to the State, on-campus consulting, and in particular offering a large variety of advanced courses as well as new online courses. A current challenge is the uncertainty regarding four senior faculty members who are on leave. Jackie Hughes-Oliver, Helen Zhang, Sastry Pantula, and Lexin Li have played a major role in the department, but for various reasons they will likely not be rejoining us. We would like assurance of continued support from the college to grow our faculty to meet the current demand for training and teaching and to continue to elevate the stature of our programs.
## Appendix A. Graduate Faculty/Student Committees Chaired Over the Last 5 Years

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<tr>
<th>name</th>
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<th>MR current</th>
<th>PhD completed</th>
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### Appendix B. Graduate Student Placement

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<td>4. Government</td>
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<td>5. Self-Employed Professionals</td>
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<tr>
<td>7. Agriculture/Forestry</td>
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<td>11**</td>
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<td>8. Other Graduate and Post-Doctoral Programs</td>
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<td>9. Other (unknown)</td>
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<td>11**</td>
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Appendix O. Objectives and Outcomes from Assessment Plan

Objectives and Outcomes:
Statistics

Program: All Programs

These are the program objectives:

1. To enable students to develop into successful professionals for employment in desirable positions in academe, government and industry.
2. To prepare doctoral students to be effective researchers in the field of Statistics
3. To enhance the visibility and stature of our graduate programs, while maintaining and improving their quality
4. To advise and mentor students to help them be successful.

Objective: To enable students to develop into successful professionals for employment in desirable positions in academe, government and industry.

a. Students will attain a high level of expertise in the theory and practice of Statistics.
b. Students will master the knowledge in their chosen areas of concentration and creatively use the associated methods to address novel and emerging problems.
c. Students will become proficient in the use of appropriate computing tools for the practice of Statistics.
d. Students will develop oral and written communication skills for addressing both technical and non-technical audiences.
e. Students will broaden their professional foundations through activities such as teaching, internships, seminar attendance and applying for fellowships and grants.
f. Students will participate in professional organizations, becoming members and attending meetings.

Objective: To prepare doctoral students to be effective researchers in the field of Statistics

a. Students will become independent researchers in some areas of study by attaining sufficient expertise to enable them to make original research contributions.
b. Students will identify important and relevant research problems and formulate successful research strategies for solving these problems.
c. Students will communicate their research clearly and professionally in both written and oral forms appropriate to their areas of specialization.
d. Students will become proficient in the use of computing and simulation techniques necessary to conduct statistical research.

Objective: To enhance the visibility and stature of our graduate programs, while maintaining and improving their quality

a. The Department will recruit, enroll and retain high-quality graduate students.
b. The Department will enhance graduate education with advanced and special topics courses.
c. The Department will enhance graduate education by providing appropriate opportunities for training outside of the classroom.
d. The Department will enhance graduate education by providing research, travel and other resources to students.
e. The Department will provide mentoring for doctoral students interested in pursuing academic careers, thereby increasing the likelihood of placing more graduates in academic positions.
f. The Department will conduct regular reviews of the graduate curriculum to ensure that it remains relevant.

**Objective:** To advise and mentor students to help them be successful.

a. Students will receive timely and meaningful feedback about their performance in the program, academic and otherwise.
b. Students will have opportunities to learn about research and job opportunities.
X. WORKING GROUPS AND OTHER PROGRAMS

The Department has a number of important programs and working groups that enhance interdisciplinary research as well as core statistical research. In this section, we report on these programs and groups. The Statistical Genetics Working Group (currently four Statistics faculty) has a long history, and some years ago spawned the Bioinformatics Research Center and a separate Bioinformatics Graduate Program, which both involve other departments, and very recently started a new consulting effort in Bioinformatics. The Biomathematics Graduate program also has a long history and is now supported by many faculty across campus including two in Statistics. For many years, the College of Agriculture and Life Sciences (CALS) has supported numerous faculty positions in our department. These faculty give statistical help to CALS faculty and students and teach methods courses. The Working Groups are informal sets of faculty within the department who work on common problems and may have special seminars.

10.1 Working Groups

A. Bayesian Working Group

The Bayesian Working Group was founded in the Department of Statistics at North Carolina State University in 2004. A sizable proportion of the faculty in the department are involved in research on various aspects of Bayesian statistics such as theory, computation, and application. Among the current faculty, Dr. Sujit Ghosh, Dr. Subhashis Ghosal, Dr. Brian Reich and a few others actively take part in the activities of the Bayesian working group. A large number of students also work in the area of Bayesian statistics. The main objective of the working group is to exchange ideas through informal meetings, seminars and group discussions. The topics range from parametric to non-parametric and high dimensional Bayesian inference, and from theory to methodology to applications, keeping up with the current developments in Bayesian inference. The group has been conducting seminars since 2004, which are held in every 2-3 weeks. Seminars have been given by many faculty members and students in the department as well as by outside speakers, and are all well attended.

B. Bioinformatics and Statistical Genetics Working Group (also see BRC in 10.3)

Faculty in the Bioinformatics and Statistical Genetics working group work on a number of research projects that concern the statistical and bioinformatics aspects of genomic sciences and systems biology. Research topics include whole-genome DNA and RNA sequence analysis, alternative splicing inference, comparative genomics and molecular evolution, quantitative trait gene mapping and genotype-phenotype relationship inference, whole-genome association mapping, transcriptomic, proteomic and metabolomics data analysis, and multiple-omics data integration and analysis. Faculty members direct a number of externally-funded research projects and also engage extensively in many collaborative research projects around the whole campus. The inter-disciplinary nature of the research, training, and collaboration is the hallmark of the group. As a result, a few faculty members have joint appointments with Genetics, and the faculty
secured the funding for two NIH interdisciplinary oriented training programs in bioinformatics (NIEHS), and biostatistics (NIH).

C. Biostatistics Working Group

Biomedical Statistics, or Biostatistics, which is the study and application of statistical methods to problems in Medicine and Public Health, started at North Carolina State University in 1996 with the hiring of Drs. Tsiatis and Davidian who were previously on the faculty in the department of Biostatistics at Harvard University. Since then, the biostatistics group at NCSU has grown to a group consisting of seven additional faculty members: Dr. Daowen Zhang joined in 1998; Dr. Wenbin Lu (2003); Dr. Jung-Ying Tzeng (2003); Dr. Judy Wang (2006); Dr. Eric Laber (2011); Dr. Jessie Jeng (2012); Dr. Rui Song (2012); Dr. Renee Moore (2012).

The group has been actively involved in statistical research working in the areas of Survival Analysis, Clinical Trials, Longitudinal and other Correlated Data Analysis, Missing data methods, Joint modeling, Group-sequential methods, Causal Inference, Variable selection, Quantile regression, Statistical genetics, Bioinformatics, Methods in personalized medicine, Measurement errors models, and Semiparametric methods. Since the last departmental review in 2004, the faculty from the Biomedical Statistics group have 137 papers published or in press in statistical journals, 27 papers published or in press in subject matter journals and at NC State have supervised, or are currently supervising 56 Ph.D. students. Papers by members of the group have appeared in journals such as Biometrika, Biometrics, Biostatistics, Journal of the American Statistical Association, Journal of Agricultural, Biological, and Environmental Statistics.

Research has been well-funded. Dr. Davidian is Principal Investigator on an NIH P01 grant and an NIH R01 grant, and Co-investigator on two others, including a multidisciplinary team applying nonlinear dynamic models to longitudinal HIV data; she is also Principal Investigator on two NIH training grants. Dr. Tsiatis is Principal Investigator on an NIH MERIT award and Co-investigator of a P01 grant; Dr. Zhang is co-investigator on two NIH R01 grant; Dr. Lu is Principal Investigator on an NIH R01 grant and Co-investigator three NIH R01 grants; Dr. Tzeng is Principal Investigator on an NIH R01 grant and Co-investigator on another NIH R01 grant; Dr. Wang is Principal Investigator of an NSF Career award and another NSF award; Dr. Laber is Co-investigator on an NIH R01 grant. Dr. Song is Principal Investigator on an NSF grant. Other than supporting research for the group, these grants also provide supports for a number of students as research assistants in the Department.

Drs. Tsiatis and Davidian are also Adjunct Professors in the Department of Biostatistics and Bioinformatics at Duke University, where they collaborate with investigators on cardiovascular disease research at Duke Clinical Research Institute one day per week (Wednesdays). This collaborative activity has continuously inspired several published research papers and dissertation topics.

To facilitate some of the research activities, the group has an active seminar series in Biostatistics, where speakers from outside the department as well as faculty and students from NC State give seminars on cutting edge research methods. In addition, the Biomedical
Statistics Working Group has also facilitated joint study of topics, where a small group get together regularly to learn, read and discuss different topics of interest. For example, topics in Missing Data Methods, Joint Modeling of Longitudinal and Primary Endpoint Data, and Causal Inference have been covered. This has been very successful, as it has led to research resulting in published papers and dissertations.

The biostatistics group is closely connected with the biostatisticians in UNC-Chapel Hill and Duke University. This connection reached a milestone when in 2010 a NIH P01 grant was awarded to NCSU, UNC-CH and Duke, where Dr. Davidian is one of three Principal Investigators and three group members are Co-investigators of this P01 grant. This joint adventure is highly productive. In an effort to enhance communication among the investigators of the project and disseminate their research results, an annual symposium with focus on clinical trials in the era of personalized medicine was created (see http://impact.unc.edu/impact/Symposium2012 for more detail).

Personalized medicine is an active new area in biostatistics. Thanks to the support from the Chancellor's Faculty Excellence Program, our biostatistics group became stronger by a cluster hiring of Dr. Rui Song. Currently five group members have research interest in personalized medicine. A lot of effort has been made to identify candidates for the other two positions in the personalized medicine cluster, and research activities such as a special seminar series and workshops are in the agenda (see http://www.ncsu.edu/project/personalmed/ for more detail)

List of faculty in core Biostatistics Working Group

Marie Davidian. Her research interests include mixed effects models, longitudinal data analysis, covariate measurement error, missing data, causal inference, personalized medicine, and analysis of assay data and calibration. She has served as Coordinating Editor of Biometrics (2000-2012).

Jessie Jeng. Her research interests include High-Dimensional Inference, Mixture Model Detection, Multiple Testing, Bioinformatics, DNA Copy Number Analysis

Eric Laber. His research interests include reinforcement learning, personalized medicine, optimization, empirical processes and the bootstrap, and analysis of large and complex data sets.

Wenbin Lu. His research interests include Survival analysis, longitudinal data analysis, semi-parametric inference, Variable selection and high dimensional data analysis, clinical trials, personalized medicine, and Statistical genetics.

Renee Moore. Her research interests include clinical trials, longitudinal data analysis, and applications of biostatistics methodology to medicine and psychology.

Rui Song. Her research interests include Variable selection, High dimensional data analysis, Semiparametric inference, Personalized Medicine, Empirical processes.

Anastasios A. Tsiatis. His primary research focuses on a variety of problems in Biostatistics. This includes developing statistical methods for the design and analysis of clinical trials,
censored survival analysis, group sequential methods, inference on Quality Adjusted Lifetime, surrogate markers, causal inference, semiparametric methods with missing and censored data, personalized medicine. In the past few years, Dr. Tsiatis has won the NCSU Alumni Outstanding Research and Teaching Awards, and has presented several distinguished lectures.

Jung-Ying Tzeng. Her research interests include Statistical methods for studying susceptibility genes for complex traits; specific topics include: statistical modeling of multimarker/haplotype association for genome-wide and candidate-gene studies, gene/pathway-based analysis for pharmacogenetics, SNP genotyping error and quality control, and sequence-based association analysis.

Judy Wang. Her research interests include Quantile regression; longitudinal data analysis; nonparametric/semiparametric regression; survival analysis; measurement error; missing data analysis; bioinformatics; mixture modeling. She received a prestigious CAREER award from NSF in 2012.

Daowen Zhang. His research interests include Clinical Trials; Correlated Categorical Data; Epidemiology; Statistical Genetics; Longitudinal Data; Missing Data; Mixed Effects Models; Semiparametric and Nonparametric Regression.

D. Environmental and Spatial Statistics Working Group

The environmental statistics working group holds a monthly seminar series. The group has been organized recently by Montse Fuentes and Brian Reich, and is currently led by Elizabeth Mannshardt. The seminar series focuses on both statistical methodology related to environmental applications, such as spatial statistics and extreme value analysis, and on environmental applications in areas such as environmental health and climate research. Speakers include NCSU students, post-docs, and faculty, as well as researchers from other local universities and organizations such as SAMSI, the US EPA, and the National Climatic Data Center. These seminars are well-attended, often with 50 or more NCSU graduate students and faculty interested in environmental problems in attendance.

E. Statistics Education Working Group

Broadly defined, research in statistics education seeks to improve the teaching and learning of statistics at all levels, including primary, secondary, and post-secondary education. This involves research on: formal classroom pedagogy, curriculum, technology and teacher training; informal (out-of-classroom) understanding and use of statistical ideas; and other cognitive and affective (e.g. motivation, value) factors that are related to the development of statistical literacy, thinking, or reasoning.

The Statistics Education Working Group at NC State focuses particularly on teaching and learning in large college courses. A major application of this is in the use of technology to facilitate content delivery, increase the efficiency of the learning experience, and demonstrate statistical concepts. Another application of this is in the training of graduate students to teach effectively. This working group is part of the larger STEM Initiative at NC State.
(http://stem.ncsu.edu/), which seeks to improve instruction through research in each of the fields of science, technology, engineering and mathematical sciences. Additionally, members of this working group often collaborate with faculty in the College of Education.

**Research Foci:**
- Teaching Statistics in Large Courses, including:
  - Consideration of issues with implementation of active learning in large courses
  - Training graduate student instructors
- Use of Technology in Statistics Education, including:
  - Designing and developing new technology tools that demonstrate statistical concepts
  - Consideration of the best pedagogical practices for teaching with technology
  - Exploring uses of technology to facilitate content delivery
  - Increase the efficiency of the learning experience through technology

**Participants:**
- Webster West
- Roger Woodard
- Herle McGowan
- Renee Moore
- Tom Reiland
- Kim Weems

### 10.2 Bioinformatics Graduate Program

NC State has a long and successful history in research and training in the interdisciplinary area between statistics and genetics. The Bioinformatics Research Center and its resident graduate program in Bioinformatics are the result of that history.

Statistical genetics has been an activity within the Department of Statistics since the department was formed, and it was one of five research areas described in the first report of the North Carolina Institute of Statistics. Ralph Comstock joined the department in 1943 and was the first to teach the Statistical Concepts in Genetics' graduate course. The interface between statistics and genetics has been an active area of research and training in the Department for the subsequent 70 years. Decorated faculty members in addition to Comstock include Clark Cockerham, H.F. “Cotton” Robinson, Major Goodman, and Bruce Weir.

In 1998 the Department took its first step towards a formal training structure in this interdisciplinary arena. In 1999, sibling degree tracks in Bioinformatics and Functional Genomics, operating as the umbrella Graduate Program in Genome Science, were authorized at NC State. A handful of enrolled NC State students transferred into the Bioinformatics program in the 1999-2000 year, leading to its first PhD graduate in 2002 (Jun Lu, under the direction of Spencer Muse). The 2000-2001 academic year was effectively the first for the program. Since that time over 100 students have earned advanced degrees from the program. These students
have moved on to successful research careers in the private, academic, and government sectors. Bruce Weir was the founding director of the Bioinformatics graduate program, followed by Zhao-Bang Zeng, and most recently Spencer Muse.

The interdepartmental Bioinformatics Research Center (BRC, founded in 2000) serves as the home for the Bioinformatics graduate students. The nine resident faculty of the BRC provide most of the core instruction for this program and supervise the majority of the students (although the substantial contributions of another dozen or so other faculty housed outside the BRC must not be ignored). In addition to four courses taught by BRC faculty, the core PhD curriculum includes courses from the Departments of Genetics, Statistics, and Computer Science.

The Graduate Program in Genome Science is the poster child for successful interdisciplinary graduate training on the NC State campus. The program has maintained a steady enrollment of quality students, attracted sustained interest from a large and exceptional group of faculty from multiple Departments and Colleges, and it has garnered extramural support in large amounts – a rarity for interdepartmental graduate programs at NC State. The Genome Science program was funded by an NSF IGERT training grant for five years (non-renewable), and the Bioinformatics Program has been supported by an NIEHS training grant (PI Zeng) that was recently renewed for years 11-15. Muse directs an NIGMS training grant now in its sixth year that supports students in either Statistics or Bioinformatics, with most of those students choosing resident BRC faculty as thesis advisors. The program is also supported by a line item in the North Carolina state budget, by teaching assistant support from the Colleges, and by Graduate Industrial Traineeships (GITs). Over the years we have placed bioinformatics students in GIT positions at regional organizations including NIEHS, GlaxoSmithKline, SAS, and RTI. Many of those students are hired by their host organizations upon graduation.

After peaking in 2005 with 51 students, enrollment in the Bioinformatics Graduate Program has decreased over the last few years and now stands at 24 (3 MR + 21 PhD). This decrease is in part a result of increased national competition as the number of Bioinformatics programs has grown, and a reduction in demand for the MR in Bioinformatics. The reduction, however, is largely an intentional change made by the Bioinformatics faculty to ensure a manageable student:faculty ratio with outstanding students. With the maturation and blossoming of the research programs of the junior faculty, the renewals of our training grants, and authorization to add three new tenure-track faculty in Bioinformatics, our plans are to grow the size of graduate program during the next several years to a steady state of about 35.

10.3 Biomathematics Graduate Program

A. Description of the Program

The NC State Biomathematics (BMA) Program was established in 1961 in the Department of Statistics. The Program sits at the interface of the mathematical and biological sciences, and has an emphasis on the use of modeling as a tool for understanding biological systems. In this respect, the Program differs from biostatistics and bioinformatics programs. The interdisciplinary research undertaken by members of the Program covers a wide area, including physiology, cell and tissue mechanics, ecology, infectious diseases, genetics and toxicology.
Until about ten years ago the Program was solely administered by Statistics. A period of several years then followed in which the Program was run jointly between the Departments of Mathematics and Statistics under the umbrella of the College of Physical and Mathematical Sciences (PAMS). For the past two years, the Program has been run solely under Mathematics, but continues to receive support from Statistics. The day to day running of the Program is handled by the Director of Graduate Programs (DGP) who reports to the Head of Mathematics, and a Program Assistant (half-time, shared with the PAMS business office).

The BMA Program offers M.S., M.BMA. (taught Master’s) and Ph.D. degrees. In recent years, the Program has typically had about 15-20 students, with an annual entry of about 3-5 students. The majority of these students are full-time and supported as teaching or research assistants (TAs or RAs), although there are typically one or two who are part-time and/or self-supporting. Partly as a consequence of student funding priorities, the majority of students are working towards a Ph.D.

The Program offers several courses at the graduate level. BMA 567 (Modeling of Biological Systems) provides an introduction to modeling and simulation. Largely focused on ecological applications, this course mainly draws non-BMA students, providing a well-received service to life sciences departments. Four courses make up the core of the BMA Ph.D. curriculum: BMA 771 (Biomathematics I: Differential Equation Models in Biology), BMA 772 (Biomathematics II: Stochastic Models in Biology), BMA 773 (Stochastic Models in Biology) and BMA 774 (Partial Differential Equation Models in Biology). BMA 771 and 772 form the core of the Master’s curriculum. While many of the attendees of these courses are BMA students, a number of Mathematics, Operational Research, Statistics and Biology students also enroll, particularly in BMA 771 and 772. Special Topics courses are also offered, such as BMA 815B (Infectious Disease Modeling). A number of courses are cross-listed between BMA and other departments, including BIO/BMA 560 (Population Ecology) and MA/BMA 591E (Differential Equation Models in Biology). The weekly Biomathematics seminar series can be taken as a one credit hour course (BMA 801).

The Program has 25 Graduate Faculty members, four of whom have faculty lines that are tied to the Program (so-called “core faculty”): two in mathematics (Lloyd and Lubkin) and two in statistics (Gross and Smith). The remaining Graduate Faculty members are designated as “associate faculty” and are drawn from a wide range of departments across the University, including Mathematics, Statistics (Muse, Zeng), Biology, Genetics, Entomology, Forestry, Chemical and Biomolecular Engineering, and the College of Veterinary Medicine.

**B. Administrative Structure**

Over the last ten years, the Program has faced a number of structural issues arising from its interdisciplinary and interdepartmental nature, most notably concerning student funding. The Program currently has 4 dedicated TA lines, with the understanding that TA assignments will be split evenly between Mathematics and Statistics. In the intermediate past, these same two departments would occasionally provide TA support beyond the dedicated lines. While this still exists as a theoretical possibility, the recent experience has been that, particularly when the
University has faced fiscal exigency, departments have protected their core programs at the expense of others. Even under favorable budgetary conditions, the allocation of funds to BMA has often been made after the departments have settled funding and admissions for core programs, hampering the BMA admissions and recruitment process. There is also the possibility of funding BMA students through TAs in the Biology department, if students have sufficient biology background to TA a lab course. Two students have been supported by this mechanism in recent years.

Two structural issues have improved notably in recent years. Dr. Alun Lloyd has served as the DGP since 2007. His continuity of service has stabilized the program after nearly a decade of high turnover among DGPs. The Program is also now housed entirely in Cox Hall, sharing a floor with the Center for Research in Scientific Computation (CRSC) and the Center for Quantitative Sciences in Biomedicine (CQSB). Although the academic missions of the CRSC, CQSB and BMA are distinct, their current housing in close proximity with one another creates an atmosphere of scholarly activity and discovery that benefits all programs. The space that BMA currently occupies is sufficient given its small current enrollment, but would not be sufficient if the Program succeeded in building enrollment back up to the low 20s.

Financial support for BMA students is typically cobbled together from a variety of sources. In recent years, there have typically been 4-6 BMA students funded as teaching assistants, 3-5 students supported by research assistantships from individual or programmatic grants, and the remainder are unfunded. A small number (one or two) of students hold full-time jobs elsewhere in the Raleigh-Durham area while working towards their Ph.D.

C. Current and future program-level activities

The Program engages in several larger initiatives that involve multiple academic units. These include:

- An NSF-funded IGERT program in Genetic Engineering and Society (GES; $3.2M, 8/2011 - 7/2016). Several BMA faculty are involved (Gould, lead PI [not formally a member of BMA, but a longtime collaborator with faculty and students in the program]; Lloyd, Haddad, co-PIs; Gilliam, Gross, participants). BMA will play a key role both the educational and research missions of the project, as all graduate students in the program will receive training in mathematical modeling in biological- and social-sciences contexts. The IGERT already supports one BMA PhD student, and has the potential to support and serve as a recruiting tool for 1-2 more.

- An NSF-funded UBM grant (Interdisciplinary Training for Undergraduates in Biological and Mathematical Sciences; $240K, 8/2011 - 7/2014). The grant sponsors educational modules that provide hands-on training in mathematical modeling of biological phenomena for undergraduates. Several BMA faculty are involved (Tran, PI; Gilliam, Lloyd, co-PIs; Banks, Gross, Haider, Lubkin, Olufsen, participants). It is envisioned that an application will be prepared for a larger "institutional" award near the end of the project period.

- An application for an NSF RTG (Research Training Grant, $2.5M requested, 8/2013 - 7/2018) entitled "Parameter Estimation Methodologies for Mechanistic Biological
"Models" is currently under review. The proposal requests support for 2 postdocs, 6 graduate students, and 4 undergraduates. Several BMA faculty are involved (Lloyd, Olufsen, lead PIs; Banks, Gross, Tran, co-PIs; Davidian, Lubkin participants).

D. Summary

Although BMA continues to face challenges, the Program provides has enjoyed several successes in recent years, and real optimism exists about the Program's future. The primary structural challenge for BMA remains insufficient dedicated funding for graduate student support, as it has for many years. While 4 dedicated TA lines are better than none, these are not enough to sustain a Program. Insufficient dedicated support places the Program at a disadvantage relative to competing programs at other institutions (the number of which continue to grow), and is the primary reason why enrollment in BMA currently hovers uncomfortably close to dropping below critical mass. Insufficient dedicated support also bogs down the DGP in continued internal negotiations for additional support, when that time might be more fruitfully spent in other, more vision-building pursuits.

Nevertheless, the BMA program has succeeded on multiple fronts, and is poised to continue to contribute to University- and nation-wide emphases on interdisciplinary research and education. The program has benefited from administrative stability, thanks largely to continuity of leadership and improved physical space. Placement of graduates has also been excellent, as 100% of PhD (9 of 9) or terminal Masters (3 of 3) graduates since 2006 have found employment in jobs related to the field or additional graduate school within one year of graduation. Looking towards the future, the formation of the new College of Sciences (COS) provides a particularly exciting opportunity for continued growth and investment at the intersection of the mathematical and biological sciences. Indeed, "quantitative biology" enjoys prominent mention in the Administration's strategic vision for COS, suggesting that BMA will be a key contributor to the University's emphasis on interdisciplinary research in coming years.
XI. CONSULTING

11.1 CALS Consulting on Campus

The Statistics Department has a long history of consulting and collaboration with faculty and students in the College of Agriculture and Life Sciences (CALS). Teaching and consulting in support of agricultural research was an important motivation leading to the creation of the Department in 1940. CALS graduate students comprise most of the audience for certain service courses (ST511, ST512, ST506, ST524) and are well represented in others, such as Design (ST711). This teaching effort extends to faculty service on graduate committees, collaborative research, and consulting.

CALS has supported the consulting efforts of the Department for many years, and CALS continues to provide significant funding for the current high level of consulting activities. The following table shows appointments with faculty and students in CALS departments for the 2011-2012 academic year. Major contributions to this consulting effort come from faculty (Dr. Consuelo Arellano and Dr. Jason Osborne), staff (Joy Smith), and students (Justin Post).

<table>
<thead>
<tr>
<th>Department</th>
<th>Appointments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal Science</td>
<td>57</td>
</tr>
<tr>
<td>Bio. and Ag. Eng.</td>
<td>84</td>
</tr>
<tr>
<td>Biology</td>
<td>38</td>
</tr>
<tr>
<td>Crop Science</td>
<td>111</td>
</tr>
<tr>
<td>Entomology</td>
<td>95</td>
</tr>
<tr>
<td>Extension</td>
<td>7</td>
</tr>
<tr>
<td>Food Science</td>
<td>55</td>
</tr>
<tr>
<td>Genetics</td>
<td>2</td>
</tr>
<tr>
<td>Horticulture</td>
<td>77</td>
</tr>
<tr>
<td>Microbiology</td>
<td>3</td>
</tr>
<tr>
<td>Plant Biology</td>
<td>21</td>
</tr>
<tr>
<td>Plant Pathology</td>
<td>21</td>
</tr>
<tr>
<td>Poultry Science</td>
<td>11</td>
</tr>
<tr>
<td>Soil Science</td>
<td>49</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>629</strong></td>
</tr>
</tbody>
</table>

While certain faculty with CALS appointments do the lion’s share of the consulting for CALS, other faculty in the department also assist in this effort. In a different form of consulting, faculty also serve on graduate committees outside of Statistics. Faculty service to CALS graduate programs, as minor representative or as a member of the graduate committee, number over 120 in the last five years. Notable contributors are Dr. Consuelo Arellano, Dr. David Dickey, Dr. Kevin Gross, and Dr. Jason Osborne. The numbers cited above give a good sense of the level of consulting in CALS. From the reports that we receive, CALS is quite pleased with the services.
we provide. Periodically we solicit comments from our clientele, but we are not including the long list of positive comments gathered as recently as Spring 2012 due to space considerations.

Recent developments:

- Dr. Alison Motsinger-Reif has started an exciting new consulting effort aimed at problems in genetics and bioinformatics---see the next section, 11.2.

- Dr. Emily Griffith was hired and will begin in January, 2013. Her non-tenure-track Research Assistant Professor (RAP) position is jointly supported by CALS and CVM (Vet School), and she will provide consulting for both colleges.

Other aspects of the consulting program:

- A long-standing required practicum on statistical consulting, ST641/ST841 has been taught for recent years by Dr. Consuelo Arellano, who has made online discussion a requirement and uses Moodle, with early success. Since it serves faculty and graduate students from across the university, this course is the primary avenue for students in other colleges to get access to statistical consulting from the department. This course also serves as a vehicle to allow all of the faculty to participate in consulting.

- Dr. Alison Motsinger-Reif has developed a course in bioinformatics consulting, currently taught as a Special Topics course ST610/810.

**Opportunities and Challenges**

The department continues to get an increasing number of requests from departments across campus, both inside CALS and outside CALS, as well as from off-campus companies and agencies of the State of North Carolina. While we would like to honor those requests and to provide quality statistical support for all types of research, the current consulting staff cannot possibly meet all the needs.

Since our teaching effort is closely related to consulting, faculty involved with consulting have historically taught the methods courses such as ST 511 and ST 512. However, the current consultants are stretched thin by their consulting activities and have less time for teaching these courses. Since faculty with experience in subject matter applications can best teach these courses, our challenge is to both hire new faculty with the right expertise but also to involve our current faculty in applications that will aid in teaching these courses.

One approach to address these challenges is to create a Consulting Center with a Director who can oversee the growing requests for consulting. With a formal structure and accountability, we can also encourage more faculty to trade some teaching responsibilities for consulting activities, bringing them closer to real data and applications. These consulting activities can then in turn lead to better teaching with more real-life examples.
11.2 Bioinformatics Consulting and Service Core

A. Motivation

Life sciences research at NCSU is increasingly relying on high-throughput technology that presents important and exciting challenges from a computational and analytical perspective. Successful use of these new technologies requires input and expertise from experts in bioinformatics to provide rigorous data storage, analysis, and interpretation collaboration and services. The scale of data generation is quickly surpassing the capacity of individual research groups, motivating the need to centralized resources for bioinformatics equipment and expertise across campus. Just as the university has centralized data generation equipment usage into service cores, an analogous model is being applied to bioinformatics services on campus. A new fee-for-service core has recently been developed to provide bioinformatics consulting and service to the university at subsidized rates. The Bioinformatics Consulting and Services Core (BCSC), housed within the Bioinformatics Research Center (BRC) provides study design, analytical, programming support and maintains computational infrastructure for life sciences researchers.

B. Timeline and Development

The BCSC has received enthusiastic support from CALS, PAMS, and the Vice Chancellor for Research. Financial support for major renovations for a server room in Ricks Hall (updated electrical, networking, security, etc) was provided by the Vice Chancellor’s office, along with funding for cutting-edge computing equipment. The renovations were completed during the Spring 2012 semester, with all equipment purchased in May/June 2012 and installed immediately after delivery.

CALS and PAMS have generously provided support for core personnel effort for three years, beginning in fiscal year 2012-2013. With this support, Dr. Alison Motsinger-Reif (Associate Professor in Statistics) is provided a one course buyout for effort to direct the core. A full-time bioinformaticist, Dr. Elizabeth School, has been hired to perform many of the services in the core and began in September of 2012. Additionally, an IT person has been hired to maintain the computational infrastructure and to ensure data is collected, transferred and stored between on campus partners that produce data, such as the Genomics Sciences Laboratory. Finally, a large amount of effort for a full time programmer, Chris Smith, is dedicated to core efforts. There are plans this coming school year to hire a junior level programmer to further support efforts. Through the generosity of the colleges, service fees will be used to upgrade and maintain computational resources and to add additional personnel.

C. Mission and Services

The mission of the Bioinformatics Consulting and Service Core (BCSC) is to provide software, hardware, and analytical support related to bioinformatics, functional genomics, and life sciences research. The BCSC provides support, resources, and expertise for the storage, management, and analysis of data related to genetics and genomics. Consulting services are available for experimental design, data management, quality control, data storage, power calculations, and
simulation studies. Analysis support is provided for all areas of genetic and genomic research, including genomics screens, sequencing alignment, qualitative and quantitative linkage, heritability analysis, segregation analysis, microarray analysis, copy number variation analysis, association analysis (both single markers and haplotypes), and cutting edge data-mining and pathway analysis techniques. Additionally, the BCSC will provide educational resources and training for the university community in the use of current software and methodology for bioinformatics analysis through workshops and seminars.

D. Infrastructure

The BCSC maintains a computing environment that contains 8 compute nodes ranging from 32GB up to 128GB of RAM. This cluster is attached to over 40 TB of local storage and has access to 110TB storage area network provided for through the High Performance Computing cluster.

This cluster has been in constant use for statistical analysis and data basing data by the faculty, trainees, staff, and customers of the BCSC. The servers have a full suite of genetic data analysis programs, such as SAS, R, Matlab, Mathematica, PLINK, Merlin, Fbat, Pbat, SOLAR, etc. The servers are housed in a dedicated server room in Ricks Hall. These servers are expandable to meet future computing and storage demands. The BCSC also relies on computing resources available through the High Performance Computing Cluster (http://www.ncsu.edu/itd/hpc/main.php).

The BCSC has the capability to create custom software using a variety of programming languages. The group has and does produce stand-alone software for genetic and genomic analysis, as well as web applications for phenotype and genotype data entry and retrieval. The BCSC also will work closely with the GSL to provide bioinformatics support and analysis for customers getting genotype data from the Genome Sciences Laboratory (GSL).

E. Successes so Far

While the BCSC is a new resource (opened in September 2012), there have been a number of successes so far. As of October 2012, the BCSC has staff in place, renovations completed, and computing equipment installed. Initial workloads are exciting, and a total of 7 consulting projects were completed in the first month. Additionally, 9 projects are ongoing, and letters and text have been provided for a total of 23 grant application across campus.

Contact: Alison Motsinger-Reif
XII. UNDERGRADUATE PROGRAM

12.1 Overview of Undergraduate program

A. Program Mission

Achieve outstanding research, teaching, mentoring, consulting and collaborations on campus and world-wide, within a cohesive and diverse department, where all students, faculty, and staff receive fair and equitable treatment.

B. Overview

NCSU offers a BS in Statistics and a minor in Statistics. At NCSU it is possible to pursue multiple majors with any combination of curricula. We also offer a 5-year accelerated program in which exceptionally strong students can complete both the BS and MStat degrees in 5 years.

The goal of the Statistics undergraduate program is to provide a broad education to a diverse student population, with special emphasis on the logic of making inferences from data and methods of collecting data capable of supporting sound inference. Statistics is inherently interdisciplinary and is applied to problems in all sciences, engineering and education, hence the NCSU undergraduate program aims to enhance appreciation and understanding of scientific fields outside of Statistics and the ability to communicate orally and in writing with non-statisticians. Strong computing skills are needed for implementing statistical methods, and a strong foundation in Mathematics is required for understanding the bases of common statistical methods. Students should acquire the skills necessary to function as a statistician in a work environment, and graduates should be prepared for graduate study in an area with a quantitative focus.

The BS in Statistics has served our undergraduate majors well, both those who plan to work in a statistics-related career immediately after graduating and those who plan to pursue graduate studies. It is focused primarily on applied statistics and gives the students an introduction to the most commonly used statistical methods. We encourage students to pursue a double major with Applied Mathematics, Mathematics Education, or a field of application of statistics. The Statistics Department has agreements with three programs—Applied Mathematics, Mathematics Education, and Economics—to offer articulated double major requirements. Currently 22 students (23% of Statistics majors) are pursuing second majors, in the following fields: Applied Mathematics (7), Business (1), Computer Science (2), Economics (7), Mathematics (3), Mathematics Education (1), and Psychology (1).

C. Program Outcomes

All students who complete the B.S. in statistics are expected to be able to:

1. Explain the theoretical basis of commonly used statistical methods.
2. Design sample surveys and experiments for standard situations.
3. Correctly analyze and interpret the results from standard designed experiments, sample surveys, and observational studies.
4. Demonstrate sufficient computer programming ability to manage data, implement standard statistical methods, and learn new programming languages in the future.
5. Explain statistical ideas, methods and results orally and in writing to non-statistical audiences.

D. Curriculum

It is intended that our courses develop the skills described in the previous section among our students. These skills reflect the statistical skills that students need to be effective statisticians and also include important skills that relate to the ability to function in the types of jobs our students are seeking.

The undergraduate Statistics curriculum includes a traditional set of required courses in statistical methods, mathematical statistics, design of experiments, regression, sampling, quality control, and statistical computing. It requires a solid foundation in mathematics, courses in the sciences, speaking and writing, computer programming, and a distribution of courses in the humanities and social sciences. The topics covered are similar to the American Statistical Association curriculum guidelines (http://www.amstat.org/education/curriculumguidelines.cfm).

The curriculum for the BS in Statistics includes:
- One semester of statistical methods (ST305)
- One year of statistical theory (ST421, 422)
- One semester each of
  - Regression (ST430)
  - Design of experiments (ST431)
  - Sampling (ST432)
  - Statistical computing (ST445)
  - Quality control (ST435)
  - A statistics elective (ST >400)
- Calculus sequence (MA141, 241, 242), linear algebra (MA405), and foundations of advanced mathematics (MA225).
- One semester of computer programming and 4 semesters of natural science.
- 15 hours (5 courses) in upper division electives, chosen from mathematics, economics, genetics and other quantitative fields.
- 10 hours (3 courses) of composition, scientific writing, and public speaking.
- 20 hours (7 courses) of humanities, social sciences and interdisciplinary courses.

E. Joint Bachelors Master’s program

Statistics majors who have at least a 3.5 grade point average as of their junior year may apply for the joint BS/MStat program. In this 5 year program the requirements for the BS degree outlined above must be completed within the first 4 years. During the senior year the students may take up to 12 hours of graduate credits that can be counted toward both the bachelor’s and the master’s degrees, and they may take an additional 6 hours of graduate level courses that count
toward only the master’s degree. They graduate with a BS in Statistics at the end of the 4th year, then complete the requirements for the master’s degree and take the master’s exams in the 5th year.

One or two students each year enroll in the 5-year BS/MStat program. This program is attractive to students because it provides the opportunity to earn a graduate degree in Statistics with only one additional year of study. It is a very demanding program, however, and is only undertaken by exceptionally strong students.

The joint BS/MS curriculum includes:
- One semester of undergraduate statistical methods (ST305),
- One year of undergraduate statistical theory (ST421, 422),
- One semester each of undergraduate regression, design of experiments, sampling, statistical computing, quality control, as well as an undergraduate statistics elective.
- Calculus sequence (MA141, 241, 242), linear algebra (MA405), and foundations of advanced mathematics (MA225).
- One semester of computer programming, 4 semesters of natural science.
- 10 hours (3 courses) of composition, scientific writing, and public speaking.
- 20 hours (7 courses) of humanities, social sciences and interdisciplinary courses.
- One year of graduate level statistical theory (ST521, 522).
- One semester each of graduate level
  - Statistical methods (ST512R),
  - Linear models (ST552),
  - Design of experiments (ST711),
  - Sampling theory (ST715),
  - Categorical data analysis (ST744),
  - Statistical consulting (ST641).
- 4 graduate level statistics electives (ST >500).

F. Undergraduate Research

The Department offers research experiences for undergraduates in order to enhance their educational experience and to help them prepare for a wide range of career opportunities. The Department has had three initiatives that we now briefly describe.

Environmental Statistics Practicum (ST495). This course has been taught each Fall by a former scientist from the Environmental Protection Agency (EPA), Bill Hunt. At the beginning of the semester, Bill contacts clients from agencies such as the EPA and the North Carolina Department of Natural Resources, who often have large quantities of data but lack the resources to analyze them. Students in the course meet with these clients to learn about their data and the questions of interest. The students then work in groups to analyze the data and write a report about their findings. The course culminates with students presenting the results to the clients. The teams have been very successful and many of these research projects are also presented at regional and national conferences or submitted to journals.
Computation for Undergraduates in Statistics Program (CUSP). Since 2008, many students have participated in the CUSP program and have completed research projects. The CUSP program is funded by the National Science Foundation’s Computational Science Training for Undergraduates in the Mathematical Sciences (CSUMS) program. The program targets rising seniors or exceptional rising juniors, and gives these students financial support to participate in additional course work and research opportunities. Through this program, students have become very involved in projects related to environmental statistics, financial statistics, and statistical genetics. This program has also been very successful but is now in its final year of funding, and renewal seems unlikely.

Independent Research. Recently we have begun to provide research assistant funds to a few undergraduate students, allowing them to work on research projects one-on-one with department faculty member. We seek to broaden this type of undergraduate research training.

Future Directions. Bill Hunt is retiring, but we want to build on the model he has created. Thus, we plan to broaden his environmental practicum to a new course with the same number and structure except that the scope will include other data-rich sciences like genetics, survey data, and using both on-campus and off-campus sources. We expect the instructor to be excited about growing the course to reach many of our senior undergraduates, and we hope to involve other faculty members with team projects.

12.2 Enrollment trends

A. Enrollment

Over the past 5 years the statistics undergraduate program has seen a surge in enrollments. This surge may be attributed to a variety of factors. Statistics has been featured in prominent news articles in the last few years. The Advanced Placement (AP) statistics program has had a similar surge in student numbers which has made many more high school students familiar with the field. The program faculty members have also developed connections with many local high schools that serve as a pipeline of students. Additionally, unlike many programs, a large percentage of students come into the statistics program as internal transfers from or double majors with other programs on campus.

The number of minors has also surged in the last 5 years. While this number of minors is relatively small, their numbers do impact the number of students in upper level statistics courses.

Table 1. Five year enrollments, second majors, minors and incoming freshmen.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total student in program</th>
<th>Students with a second major</th>
<th>Minors</th>
<th>Incoming Freshmen</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>60</td>
<td>14</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>2009</td>
<td>77</td>
<td>23</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>2010</td>
<td>92</td>
<td>26</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>2011</td>
<td>100</td>
<td>25</td>
<td>20</td>
<td>13</td>
</tr>
<tr>
<td>2012</td>
<td>96</td>
<td>22</td>
<td>24</td>
<td>17</td>
</tr>
</tbody>
</table>
B. Retention, graduation rates and degrees awarded

Students in the statistics program tend to be good students and continue at the university. The persistence rate is defined as the percentage of students that are still enrolled at the university during their subsequent sophomore year. Almost all students from our past 5 years have persisted through the second year.

Table 2. Persistence rate.

<table>
<thead>
<tr>
<th>Fall</th>
<th>Freshman Cohort Size</th>
<th>Persist Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>6</td>
<td>100.0%</td>
</tr>
<tr>
<td>2008</td>
<td>5</td>
<td>100.0%</td>
</tr>
<tr>
<td>2009</td>
<td>7</td>
<td>100.0%</td>
</tr>
<tr>
<td>2010</td>
<td>12</td>
<td>91.7%</td>
</tr>
<tr>
<td>2011</td>
<td>13</td>
<td>84.6%</td>
</tr>
</tbody>
</table>

Although there is an upward trend in the student enrollments, the number of degrees offered is relatively flat. This is due to the time lag for graduation and will begin to surge in the next few years. Most students who enter the statistics major finish the program promptly. However, the large number of students who transfer into the program increase the time to graduation. For instance, a student who transfers from a nuclear engineering program may have several engineering courses that are not applicable to the requirements of the statistics degree and thus have a larger number of years to degree. As such, the average years to graduation are slightly higher than that of the University overall (4.25 years).

Table 3. Degrees and time to degree.

<table>
<thead>
<tr>
<th>Year</th>
<th>Degrees</th>
<th>Avg Years to Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007-08</td>
<td>18</td>
<td>4.94</td>
</tr>
<tr>
<td>2008-09</td>
<td>22</td>
<td>4.68</td>
</tr>
<tr>
<td>2009-10</td>
<td>16</td>
<td>5.31</td>
</tr>
<tr>
<td>2010-11</td>
<td>18</td>
<td>5.00</td>
</tr>
<tr>
<td>2011-12</td>
<td>34</td>
<td>4.32</td>
</tr>
</tbody>
</table>

12.3 Assessment Plans

In accordance with the university’s requirements for program assessment, we evaluate all five of the program outcomes each year. We use a variety of methods to evaluate these programs outcomes.
A. Exit interviews

The majority of graduating students meet with the Director of Undergraduate Programs (DUP) prior to graduation. During this interview, students report on their plans after graduation and quantify their achievement of the program outcomes. Although graduating senior surveys could be used to ask about the student’s achievement of the program goals, the exit interview allows the director to probe for additional information that may be relevant.

B. Oral Exams

More recently we have created content-related questions that are presented to graduating students as an oral exam. This oral exam is partially modeled on the oral exams used for students completing the master’s program in statistics and partially on employment interviews used by area employers. The student typically meets with the DUP for the exit interview and then they are joined by the undergraduate advisor or another faculty member for the oral exam.

The two faculty members then proceed to ask the students a series of questions that are keyed to the program outcomes. These questions are free-form and Socratic in nature to fully explore the student’s depth of knowledge. Although the entire question set is not written in advance, there are a set of base questions that form starting points for the discussion. These base questions ensure that all program outcomes are assessed. Typically, an oral exam starts with presenting students with computer output from a common statistical procedure. The students are asked a series of questions regarding the interpreting the output and the statistical theory behind the procedures. During the exam, both faculty members score students on each of the outcomes. Each student was assigned a rating for each of the tasks as “incorrect,” “partially correct,” or “essentially correct.” Overall, consistency in the ratings was high, with any discrepancies being discussed until consensus was reached.

C. Advising reports

While the exit interview and oral exam are very effective at finding information at the end of the program, there is also need for information throughout the student’s program. To obtain this information, the department uses an undergraduate student advising report. This report is completed by each student and submitted to the advisor prior to releasing their advising hold for registration. This form asks a variety of questions to help advisors be more informed about factors that may impact advisee’s academic performance. Although the data collected can be summarized across students, it also serves as a starting point for academic advisors to discuss key issues with individual students. For instance, the form includes the question “What careers are you considering?” An advisor can more effectively direct students to appropriate courses if they know the eventual career goals.

12.4 Assessment Results and Interpretation

A. Exit interviews: Students’ perceived confidence

During the exit interviews most students expressed a very positive impression of the department.
In rating their own confidence in the skills related to the learning outcomes, each graduate was asked to assess their confidence on a four point scale that included: “not at all confident,” “somewhat confident,” “confident,” and “very confident.” The confident and very confident categories are combined and the results are presented in the following table.

### Table 4: Summary of percent of students confident or very confident.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Question: How confident would you be if you were asked to …</th>
<th>2008 (n=14)</th>
<th>2009 (n=15)</th>
<th>2010 (n=14)</th>
<th>2011 (n=9)</th>
<th>2012 (n=18)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explain the theoretical basis of commonly used statistical methods.</td>
<td>Explain statistical theory</td>
<td>50%</td>
<td>53%</td>
<td>38%</td>
<td>67%</td>
<td>83%</td>
</tr>
<tr>
<td>Design sample surveys and experiments for standard situations.</td>
<td>Design an appropriate data collection plan for a sample survey</td>
<td>79%</td>
<td>80%</td>
<td>86%</td>
<td>77%</td>
<td>72%</td>
</tr>
<tr>
<td></td>
<td>Design an appropriate data collection plan for a designed experiment</td>
<td>71%</td>
<td>67%</td>
<td>71%</td>
<td>67%</td>
<td>77%</td>
</tr>
<tr>
<td></td>
<td>Design an appropriate data collection plan for a quality control experiment</td>
<td>64%</td>
<td>60%</td>
<td>86%</td>
<td>55%</td>
<td>77%</td>
</tr>
<tr>
<td>Correctly analyze and interpret the results from standard designed experiments, sample surveys, and observational studies.</td>
<td>Select the appropriate analysis technique</td>
<td>71%</td>
<td>93%</td>
<td>100%</td>
<td>89%</td>
<td>94%</td>
</tr>
<tr>
<td>Demonstrate sufficient computer programming ability to manage data, implement standard statistical methods, and learn new programming languages in the future.</td>
<td>Use statistical computing</td>
<td>71%</td>
<td>74%</td>
<td>64%</td>
<td>89%</td>
<td>77%</td>
</tr>
<tr>
<td>Explain statistical ideas, methods and results orally and in writing to non-statistical audiences.</td>
<td>Communicate in orally or in writing</td>
<td>79%</td>
<td>87%</td>
<td>79%</td>
<td>77%</td>
<td>89%</td>
</tr>
</tbody>
</table>

In the past, most students felt only somewhat confident about explaining statistical theory. It became clear during the interviews that this was a result of general anxiety about the ST421/ST422 sequence, which develops most of the statistical theory. In recent years, the
majority of students felt very confident in this area. This increase in confidence may be the result of random variation but also may be the result of the rotation of new instructors in the ST421/ST422 sequence over the past few years. While most students still feel that these two courses are the most challenging of the program, these new instructors are popular with the students.

B. Oral Exam: Performance on content questions

The oral exam has been in place for the last 3 years. The following table gives a summary of the program outcomes, the interview tasks and the percentage of students who achieved a rating of essentially or partially correct.

Table 5: Summary of Percentage Correct (Essentially or Partially) on Oral Exam

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Task</th>
<th>2010 (n=14)</th>
<th>2011 (n=9)</th>
<th>2012 (n=14)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explain the theoretical basis of commonly used statistical methods.</td>
<td>Explain the meaning of a p-value</td>
<td>43%</td>
<td>67%</td>
<td>71%</td>
</tr>
<tr>
<td></td>
<td>Describe the technical characteristics of the F-distribution</td>
<td>57%</td>
<td>78%</td>
<td>92%</td>
</tr>
<tr>
<td>Correctly analyze and interpret statistical results</td>
<td>Determine if the model presented in the output is significant</td>
<td>86%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Explain how the values in the standard ANOVA table are related</td>
<td>79%</td>
<td>83%</td>
<td>86%</td>
</tr>
<tr>
<td>Explain statistical ideas to non-statistical audiences</td>
<td>Explain the meaning of the coefficient of determination (R²) in layman’s terms</td>
<td>57%</td>
<td>89%</td>
<td>92%</td>
</tr>
<tr>
<td>Demonstrate sufficient computer programming ability</td>
<td>Outline an appropriate “data” step in SAS to produce the output</td>
<td>78%</td>
<td>100%</td>
<td>92%</td>
</tr>
<tr>
<td></td>
<td>Outline an appropriate “proc” step in SAS to produce the output</td>
<td>71%</td>
<td>56%</td>
<td>79%</td>
</tr>
</tbody>
</table>

C. Advising reports

The advising reports have continued to be very successful in informing us about the program. One question directly asked about the program outcomes: “Over the last semester do you feel you learned about SAS in your classes?” The responses to the question regarding SAS software are summarized below.
<table>
<thead>
<tr>
<th>Year</th>
<th>Yes</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>69%</td>
<td>54%</td>
<td>76%</td>
<td>68%</td>
<td>75%</td>
</tr>
</tbody>
</table>

When probed during advising most students mentioned learning about SAS in ST445, which specifically gives instruction about this software. Many others specifically mentioned ST305 which is the first introduction to SAS. In earlier years courses such as 430, 431, and 432 were more prominent in responses to this question, but those responses have dropped off slightly in recent years.

12.5 Application of results to program planning

A. Current challenges and responses

The results of our assessment program and enrollment trends have led to several programmatic improvements over the past 5 years. As mentioned before, the mathematical statistics sequence has consistently been a challenge for students. The results of our assessments have shown both increased confidence and increased performance on items related to mathematical statistics. While these results are laudable, we continue to be cognizant of the ST421/ST422 sequence. The sequence has recently become large (see appendix for enrollment trends) with over 70 students in a single section. This larger size is a combined result of increased numbers of our own students as well as increased numbers of minors and outside departments that are encouraging their students to take the classes. It is our belief that the students would benefit from a smaller class size. In 2012, the department began offering sections of ST421 and ST422 during the summer session. Only 8 students were enrolled for this initial summer offering, however we believe that as time goes on and students become aware of the availability of this course the size will increase and will relieve some of the demand on the mathematical statistics sequence during the main academic year.

The Statistical Computing (ST445) course is also facing enrollment pressure. The course is offered in our Statistics Instructional Computing Lab (SICL), which has 28 workstations. The increased enrollment in the program and in the minor has led to many students unable to enroll in ST445 until later in the program. Students in the minor often must take other courses such as ST431 and miss the opportunity to obtain the SAS skills they desire. To try to meet this demand we have begun offering ST445 during summer sessions.

The use of SAS and other statistical software is a key skill for employers of our students. Advising reports have shown a decrease in the proportion of students who recall SAS usage in later courses such as ST431 and ST432, but steady numbers who feel they have learned about SAS from ST445. This matches the results of the oral exams, in that larger percentages of students could perform data handling steps in SAS a skill learned in ST445. However, lower numbers could implement analysis procedures that would have been solidified in later courses such as ST432. As a result of this assessment we are developing a standardized rubric to evaluate SAS programming. This rubric will give students a consistent message regarding the importance of software. It will also allow instructors to more readily implement assignments that use the software.
B. Future Challenges

The program currently is holding steady at around 100 students. There is the potential for larger number of students to seek an undergraduate degree in statistics. We are already facing enrollment challenges in several of our key courses. In addition to the mathematical statistics and computing courses, our course on Regression Analysis (ST430) has over 50 students. This course is combined with a graduate regression course for management (ST514). We anticipate the need to split this piggyback offering. However, if the program continues to grow and the demand for courses from outside departments continues to grow, we expect that many of our courses will face enrollment pressure. Our goal will be to keep courses for our major below 50 students.

Our undergraduate research program has been very successful over the past 5 years. However, we are facing the retirement of a key faculty member who has coordinated research opportunities and mentored our undergraduate researchers.
XIII. FACILITIES

13.1 Space

The Department of Statistics moved into its current space in the fourth and fifth floors of SAS Hall in May 2009. While SAS Hall holds most of the Department’s activities, 15 offices for 50 graduate students reside in the Bureau of Mines (BoM) Building, roughly a five-minute walk from SAS Hall. The new building holds 53 offices for faculty and staff, 19 offices for 80 graduate students, two conference rooms and a commons area (5104). Teaching spaces include two designated classrooms (40 and 56 seats), a tutorial room, and a computing classroom (SICL)(28 seats) on the ground floor, as well as a seminar room (5270)(30 seats) on the fifth floor. Also housed in SAS Hall are a computer server room, two storage rooms, copy and mail rooms, and storage closets. Additional graduate student spaces include two computing labs located in SAS Hall, and a third in BoM. Two student study areas are located on the fourth floor of SAS Hall; a third is in BoM.

We are facing a space crunch in two areas: faculty and graduate students. At present, we have no empty offices with one faculty member due to arrive in August 2013 with postdocs. We are also in the process of interviewing for three additional faculty in cluster positions. In addition, we are using the offices of two faculty currently on leave; should they return the deficit would increase to 7 offices. At present, we have as many desks as doctoral students. As we are expanding the number of Master’s students with the One Year program, we need to provide additional study areas and computer labs for those students.

13.2 Communications

The university computer center (NCSU OIT) provides the backbone network for communications and gateways to the outside world. SAS Hall is connected to this backbone by 10Gb switch; the Bureau of Mines building connection is a 1 Gb switch. Each office in all locations are connected by 100Mb or higher twisted pair cable according to the NCSU wiring standards. The wireless communication system (802.11g standard) is currently operating throughout campus. The expansion of the 802.11n to critical buildings, including SAS Hall, is currently in progress. The telephone system in both buildings is VOIP.

13.3 Computing

The Statistics Department operates most of its computing facilities independently of the Campus OIT. We have a dedicated server room in SAS Hall (5283) to house most of our equipment, with backup servers in shared server rooms located in Poe and Cox Hall.

Currently we have 10 Windows Servers running our Active Directory Domain. These servers perform various jobs from controlling logins to storing files for all faculty and students to providing printing and file transfer services. These servers are divided between SAS Hall and Cox Hall to provide disaster recovery and to ensure redundancy.

Faculty and staff all have computers for their work. The dominant configuration, used by 46 faculty/staff, is a Windows PC connected to the Department AD Domain. In addition, another 58
Windows-based laptops are used by faculty, staff, and students. Some 17 faculty use Linux/Unix machines as their primary computing resource. Another 24 Apple Macintosh Computers (laptops and desktops) are used by faculty.

In addition to our AD Domain the Statistics Department provides solutions for running simulations or large, memory bound tasks. Currently we have three shared facilities available.
- A Linux cluster providing users with over 124 cores to run simulations on.
- A Windows cluster providing users with over 48 cores primarily supporting WinBugs.
- A group of experimental GPU Servers to allow users to run simulations against GPUs instead of standard CPU Cores.

We also run our own web and database servers. These servers are split between two locations to reduce downtime and to keep our web presence dynamic. We also provide custom webservers dedicated to hosting the instructional software system StatCrunch system, also in a redundant fashion.

There are four computer labs:

- 1107 SAS Hall (SICL)(Teaching Lab) - 29 PCs running Windows 7 connected to Department AD Domain
- 4213 SAS Hall (Graduate Lab) - 14 PCs running Windows 7 connected to Department AD Domain
- 5285 SAS Hall (Student Lab) - 24 PCs running Windows 7 connected to Department AD Domain
- 201 Bureau of Mines (Graduate Lab) - 19 PCs running Windows 7 connected to Department AD Domain

Most of the classrooms on campus now have a computer and projection facilities managed by NCSU ClassTech. These include the two classrooms designated to Statistics instruction, SAS 1108 and SAS 1216. The computing and display facilities in SICL (SAS1107) and the seminar room (SAS5270) are managed by the Department.

13.4 Software

Software licenses are handled in different ways. The site license for the primary statistical software system SAS is managed by NCSU OIT. The second important software is the free system R, which is updated by the Department on its own facilities; updates on the ClassTech machines sometimes lag. OS (Windows and Linux) and office software licenses (e.g. Adobe) are handled through the College of PAMS. NCSU OIT also manages MatLab licenses. The Department also handles MathType, WinEdt, and StatCrunch licenses.

13.5 Technical Support

The department's senior System Administrator (Terry Byron) provides most of the computing support for the department. His core duties are 1) to keep the infrastructure running, including file, mail, web, and print servers, 2) maintain the communication system, and 3) providing
software and hardware support. In addition, the systems administrator also purchases and installs equipment, maintains an inventory system, and consults with faculty on equipment purchases from grant funds. A junior SysAdmin (Chris Waddell) supports the AD filesystem and various databases. A SAS consultant (Joy Smith) consults both within and outside the department on SAS, and teaches regular short courses on SAS. A senior faculty member (John Monahan) supervises the systems administrator and assists in planning purchases and innovations the department's computing system. The college of PAMS provides some infrastructure support.

13.6 Financial Support for Computing

The department has no budget specifically designated for computer and communications equipment in support of administration and research. Funds from the Educational Technology Fee (ETF) supports student infrastructure needs and public computing facilities. The department has used its modest ETF funds to purchase and maintain the computers and printers for the three graduate student facilities, some shared facilities such as a WinBugs cluster and a parallel AD storage system, as well as partly support the computing staff. External grants can have only a limited effect on the computing environment in the department for several reasons. First, under university accounting rules, most desktop PC's and laptops are classified as office equipment and supposedly covered by overhead. As a result, these cannot be purchased with grant funds as a direct cost, while actual overhead returns are overpromised elsewhere. Second, researchers rightly view the computer equipment they can purchase with grant funds as their reward for earning the grant. Third, rarely can grant funds be applied to any infrastructure improvements; funding programs for shared facilities, such as NSF's SCREMS, can provide for the purchase of equipment dedicated to research (e.g. Beowulf), but they can only support infrastructure and personnel in a very limited fashion. As a result, the greatest effect of external funding on computing is their effect on releasing salary, and this salary release supports the computing and communications infrastructure in the department. The lack of a dedicated budget and limited use of grant funds produces a 'feast or famine' budget for computing. The 'feast or famine' situation puts great pressure on long-range planning which is difficult to begin with because of unpredictable changes in computer technology and markets, as well as unpredictable decisions on university infrastructure.
XIV. SERVICE COURSES REVIEW

The Statistics Department has a very strong service component consisting of (i) five non-calculus-based undergraduate service courses; (ii) four calculus-based undergraduate service courses; and (iii) ten graduate service courses. Many NCSU departments recognize the important role that statistics plays in their disciplines. As a result, these departments advise their students to complete statistics courses as part of their curriculum.

The service courses review section is organized as follows. There is a subsection for each of the three aforementioned groups of courses. Each section contains a general overview, challenges and opportunities, as well as detailed descriptions of each course, including enrollment statistics.

14.1 Non-calculus-based Undergraduate Service Courses

Non-calculus-based service courses ST 101, ST 311, ST 312, ST 350 and ST 361 are General Education Program (GEP) courses in the Mathematical Sciences category. The GEP became effective in the summer of 2009, replacing the General Education Requirement (GER) plan, and was established to “enhance students’ intellectual engagement in their majors, prepare them for the changing demands of professional careers, equip them for a lifetime of learning, and lay the foundation for involvement in their communities as responsible citizens and leaders.” NC State University requires 6 GEP credit hours in the Mathematical Sciences, and many departments specify a statistics course to fulfill those requirements.

ST 101 (Statistics by Example) is a course designed to promote statistical literacy among students who will not necessarily produce statistics. The emphasis in this course is placed on interpretation instead of computation, and examples from real-world situations are used to encourage critical thinking. In accordance with the Guidelines for Assessment and Instruction in Statistics Education (GAISE) Project, ST 101 emphasizes statistical literacy, uses real data, stresses conceptual understanding, foster’s active learning, and uses technology to develop understanding and analyze data.

Challenges and Opportunities: ST 101 is becoming a more popular choice among the GEP courses. Enrollments in ST 101 more than doubled in 2009 with the addition of students from Elementary Education.

ST 311 (Introduction to Statistics) has the largest enrollment among all Statistics courses, with approximately 1700 – 2000 students enrolled per calendar year. The course enrollment has grown steadily since 2009. ST 311 provides a solid foundation in descriptive and inferential statistics using algebra skills. Most colleges and universities teach courses equivalent to ST 311, and high school students who score at least a 3 on the Advanced Placement (AP) statistics exam often receive credit for ST 311. About 20 sections are taught each semester by faculty and graduate student teaching assistants (TAs); the TAs are carefully selected and required to complete a rigorous training program at the beginning of the academic year as well as attend weekly meetings with the ST 311 course coordinator. Since Fall 2011, most sections of ST 311 have been taught as a hybrid course, with about two-thirds of the course presented online and one-third of the course presented in an active and group learning environment. A distance
education (DE) section has been offered since 1994, and a sports statistics section was offered once in Spring 2011. In 2010, the Department began offering ST 312 (Introduction to Statistics II) to provide a second course in Statistics to students without a calculus background.

Challenges and Opportunities: ST 311 will continue as a hybrid course. The course coordinator and faculty are beginning to formally evaluate the effectiveness of the hybrid versus the traditional class structure. Enrollments increased significantly between 2011 and 2012. There is an opportunity to promote ST 312 among more programs that would like for their majors to have additional Statistics coursework.

ST 350 (Statistics for Business and Economics) is required of all of all students with a major in the College of Management (COM) and is comparable to ST 311. This course is also cross-listed as BUS 350. The remaining students in ST 350 come from a variety of colleges; however, most non-COM majors still take ST 311 instead. A typical semester consists of 3 sections, including a DE section which was first offered in Fall 2008. Students are required to register for a lab (problem) session which is led by graduate TAs.

Challenges and Opportunities: The ST 350 lab attendance is poor because four hours per week are required for a three credit-hour course.

ST 361 (Introduction to Statistics for Engineers) is a course which is comparable to ST 311, yet it focuses on applications to engineering. This course is the only non-calculus-based engineering statistics course as most of the engineering programs require one of the calculus-based courses. Enrollment in this course peaked between 2008 and 2009 (over 150 students); however, for the past 3 years, the average enrollment has been about 80 students annually. Most of the students now come from the College of Textiles.

Challenges and Opportunities: Enrollments in ST 361 have declined considerably since 2009, mainly due to the variety of choices that the College of Textiles undergraduate students now have. The B.S. degree in Textile Technology is the only one which requires ST 361. However, many students transfer into this program from Engineering, and their ST 370 credit is allowed to substitute for ST 361. Most Polymer and Color Chemistry majors choose ST 311 or ST 361. The other majors in Textiles (Fashion and Textile Management and Fashion and Textile Design) usually take ST 311. There is room for other degree programs to adopt this course.
ST 101 – Statistics by Example

- Prerequisites: None
- Term and frequency: Every Fall and Spring
- Student audience: Freshman or higher students
- Credit: 3 credits
- Recent instructors: Herle McGowan
- Background and goals: The central theme of the course is to help you learn to understand the world from data. Specifically, the course will enable you to: 1) incorporate statistical thinking into your everyday lives; and 2) acquire the necessary data-gathering, data-analysis, interpretation, and communication expertise to meet the challenges of a more demanding cognitive global environment. This course will require you to: think critically, be skeptical, think about variation, and move beyond a "memorize the answer" approach. Some mathematical skill is required to work with elementary statistics, but mathematical manipulations will be replaced by relying on technology for the calculations and graphics.
- Content: Sampling, experimental design, tables and graphs, relationships among variables, probability, estimation, hypothesis testing. Real life examples from the social, physical and life sciences, the humanities and sports.
- Alternatives: None
- Subsequent courses: None

![ST 101 Enrollments](chart.png)
### ST 101 Four-Year Enrollments by College

<table>
<thead>
<tr>
<th>College</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>4 yr total</th>
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<td><strong>271</strong></td>
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ST 311 – Introduction to Statistics

- Prerequisite: None
- Student Audience: A broad introductory course for a variety of majors. Many degree programs require ST 311. Almost all majors are represented in ST311 except College of Engineering and College of Business.
- Credit: 3 Credits
- Recent Instructors: Roger Woodard (coordinator), Herle McGowan, Spencer Muse
- Recent texts: Stats Data and Models by De Veaux, Velleman, and Bock.
- Background and goals: This is a broad overview of inference. It concentrates on the importance of data collection methods and the role of the sampling distribution in inference. It covers basic data collection, confidence intervals, hypothesis testing and simple linear regression.
- Content: Examining relationships between two variables using graphical techniques, simple linear regression and correlation methods. Producing data using experiment design and sampling. Elementary probability and the basic notions of statistical inference including confidence interval estimation and tests of hypothesis. One and two sample t-tests, one-way analysis of variance, inference for count data and regression.
- Credit not allowed if student has prior credit for another ST course or BUS 350
- Alternatives: Students in Business would take ST 350. Students in engineering take ST 370 or the ST 371/372 sequence.
- Subsequent courses: ST 312 (optional)
<table>
<thead>
<tr>
<th>College</th>
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ST 312 – Introduction to Statistics II

- Prerequisites: ST 311
- Term and frequency: Fall and Spring
- Student audience: A broad selection of majors from across the campus.
- Credit: 3 credits
- Recent instructors: Roger Woodard
- Recent texts: *Stats Data and Models* by De Veaux, Velleman and Bock.
- Background and goals: This is a second course in statistical inference. It was created for departments that wanted a more extensive treatment of statistics but did not have a strong calculus background (that would take ST 371/ST 372).
- Content: A further examination of statistics and data analysis. Inference for comparing multiple samples, experimental design, analysis of variance and post-hoc tests. Inference for correlation, simple regression, multiple regression, and curvilinear regression. Analysis of contingency tables and categorical data.
- Alternatives: None
- Subsequent courses: Students who are minoring in Statistics can use the sequence ST 311/ST 312 as prerequisite for ST 430, ST 431, ST 432, ST 435 and ST 445.

![ST 312 Enrollments](image)
<table>
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ST 350 – Economics and Business Statistics

- Prerequisites: MA 114
- Term and frequency: Fall, Spring, Summer
- Student audience: Undergraduate majors in the Poole College of Management
- Credit: 3 credits
- Recent instructors: Thomas Reiland, Curt Youngblood
- Background and goals: The central theme of the course is to help you learn to understand the world from data. "Beyond the formula" skills are emphasized. The principal emphasis throughout the course will be the logic of scientific inference from experimental data. The primary goals of the course are to enable you to: i) incorporate statistical thinking into your everyday lives; ii) acquire the necessary data-gathering, data-analysis, and communication/interpretation expertise to meet the challenges of a more demanding cognitive global environment.
- Content: Graphical and numerical summaries of univariate and bivariate data; data gathering and strategies in sample surveys; probability, random variables, expected value and variance; binomial, geometric, Poisson and normal probability models; sampling distribution models; statistical inference for one and two proportions and for one and two means; correlation, simple linear regression, multiple regression. Computer use to summarize and analyze data is strongly emphasized.
- Alternatives: BUS 350
- Subsequent courses: ST 412, ST/EC 351, EC 451, several BUS and ACC courses at the 300- and 400-level.

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![ST 350 Enrollments](chart.png)
<table>
<thead>
<tr>
<th>College</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>4 yr total</th>
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<td><strong>235</strong></td>
<td><strong>271</strong></td>
<td><strong>1013</strong></td>
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</table>
ST 361 – Introduction to Statistics for Engineers

- Prerequisites: College Algebra
- Term and frequency: Every Fall and Spring
- Student audience: Students primarily in the college of textiles who do not have a calculus background.
- Credit: 3 Credits. Credit not allowed for both ST 361 and ST 370 or ST 380
- Recent instructors: Tom Gerig, Bill Hunt
- Recent texts: *Applied Statistics for Engineers and Scientists, 2nd Edition*, by Devore and Farnum
- Background and goals: This is a course that is comparable to ST 311 but targeted to students in engineering disciplines.
- Content: Statistical techniques useful to engineers and physical scientists. Includes elementary probability, frequency distributions, sampling variation, estimation of means and standard deviations, basic design of experiments, confidence intervals, significance tests, elementary least squares curve fitting.
- Alternatives: None
- Subsequent courses: None

### ST 361 Enrollments

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<td><strong>Total</strong></td>
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14.2  Calculus-based Undergraduate Service Courses

The calculus–based undergraduate service courses include ST 370, ST 371, ST 372 and ST 380. The first three are designed for undergraduates in Engineering; ST 380, however, serves primarily undergraduates in Meteorology and other physical and mathematical sciences.

ST 370 (Probability and Statistics for Engineers) has the largest enrollment among the calculus–based undergraduate service courses. Upon the request of engineering faculty, this one-semester probability and statistics course, consisting of about 2/3 statistics and 1/3 probability, was created in 1995 for their undergraduate majors. ST 370 follows a non-tradition sequence of topics: it begins with experimental design, factorial data analysis and ANOVA, and it ends with hypothesis testing and confidence intervals. This sequence allows for the students to complete a group project, in which they design an experiment, collect and analyze data, and prepare a written report. Approximately 100 students enroll in each of the five to six ST 370 sections taught during the fall and spring semesters. Online and DE sections are available. Homework is completed via WebAssign (https://www.webassign.net/ncsu), an online homework delivery system. During the past ten years, the primary software package has changed from Matlab to StatCrunch in the face-to-face sections. The online and DE sections offer the following options regarding software: S, R, Matlab, and JMP.

Challenges and Opportunities: Faculty members have discussed redesigning ST 370 in order to make it a hybrid course. Some ST 370 students have taken AP Statistics in high school, while others have never taken a statistics course. As a result, it is challenging to teach this course to students with such a wide range of backgrounds. A hybrid structure would allow those with some statistics background to cover the material at a faster pace while still having some face-to-face contact with faculty. Efforts to streamline the project component are also being considered in order to make its assessment more manageable.

ST 371 (Introduction to Probability and Distribution Theory) and ST 372 (Introduction to Statistical Inference and Regression) comprise a two-semester probability and statistics sequence. ST 371 is a required course for students in Electrical and Computer Engineering, while the ST 371-372 sequence is required for Industrial Engineering majors. Two sections of ST 371 are offered every Fall and Spring with an average enrollment of about 100 students per section. One section of ST 372 is offered every Fall and Spring with an average enrollment of about 50 students per section. The courses are also offered during the summer (ST 371 in Summer I and ST 372 in Summer II).

Challenges and Opportunities: Although there is not a lab component in ST 372, StatCrunch is used as a pedagogical tool. It may be useful to introduce the students to statistical functions in other software packages, such as Matlab, used by engineers.

ST 380 (Probability and Statistics for the Physical Sciences) is a one-semester course designed for Meteorology majors. First taught in 1994, the course curriculum includes roughly 1/2 probability and 1/2 statistics. Initially, this course met weekly in the computer lab to do exercises in S; however, there is no longer a lab component, and the amount of computing and
software varies by instructor. One section of ST 380 is taught during the Fall semester to approximately 30 – 50 students.

Challenges and Opportunities: Although ST 380 was originally designed for Meteorology majors, more Mathematics majors (Mathematics, Applied Mathematics and Mathematics Education) have begun to enroll in this course. There is an opportunity to promote ST 380 among other majors in the physical sciences.
ST 370 – Probability and Statistics for Engineers

- Prerequisites: MA 241
- Term and frequency: Every Fall and Spring
- Student audience: sophomores, juniors and seniors in engineering disciplines
- Credit: 3 credits
- Recent instructors: Eric Laber, Renee’ Moore, Charles Smith, Ana-Maria Staicu, Kim Weems, Hua Zhou
- Background and goals: Calculus-based introduction to probability and statistics with emphasis on the student being able to gather and analyze data for a two or higher factor designed experiment as a final project. ANOVA and multiple regression analyses are done using Matlab, R, JMP, or StatCrunch. Statistical methods include point and interval estimation of population parameters and curve and surface fitting (regression analysis).
- Content: The course is divided into 8 units: Collection and Analysis of Data, Experimental Design and Factorial Experiments with ANOVA, Simple and Multiple Regression, Probability, Random Variables, Random Samples and the Central Limit Theorem, Estimators and Confidence Intervals, Hypothesis Testing.
- Alternatives: ST371-372
- Subsequent courses: none

![ST 370 Enrollments](image_url)
### ST 370 Four-Year Enrollments by College

<table>
<thead>
<tr>
<th>College</th>
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<th>4 yr total</th>
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<td>31</td>
<td>20</td>
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<tr>
<td>Physical &amp; Math Sci</td>
<td>38</td>
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<td><strong>Total</strong></td>
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<td><strong>911</strong></td>
<td><strong>950</strong></td>
<td><strong>989</strong></td>
<td><strong>3748</strong></td>
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### ST 370 2012 Enrollments by Program

<table>
<thead>
<tr>
<th>Program</th>
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</tr>
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<tbody>
<tr>
<td>Aero &amp; Mechanical Eng</td>
<td>221</td>
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<tr>
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<tr>
<td>Civil, Env &amp; Construct Eng</td>
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<td>Textile Engineering</td>
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<td>Non-engineering</td>
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<td>Other Engineering</td>
<td>31</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>989</strong></td>
</tr>
</tbody>
</table>
ST 371 – Introduction to Probability and Distribution Theory

- Prerequisites: MA 241 (Calc II); also should have taken or be taking MA 242 (Calc III).
- Term and frequency: Every Fall, Spring, and Summer I
- Student audience: Freshman or higher students in the physical sciences, computer science, and engineering.
- Credit: 3 credits
- Recent instructors: Herle McGowan
- Background and goals: This course is the first semester of a two-course sequence, ST371-372, covering probability and statistics. The objective of this course, ST371, is to develop a calculus-level understanding and working knowledge of basic probability. Concepts, methods and applications are emphasized, rather than theory. Successful completion of this course will prepare students for ST 372 and provide them with a foundation for understanding probability-based material presented in other courses.
- Content: Basic probability, conditional probability, independence, discrete probability distributions, continuous probability distributions, sampling distributions and the central limit theorem
- Alternatives: None
- Subsequent courses: ST 372

### ST 371 Enrollments

<table>
<thead>
<tr>
<th>Year</th>
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</tr>
</thead>
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</tr>
<tr>
<td>2012</td>
<td>441</td>
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### ST 371 Four-Year Enrollments by College

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<th>2011</th>
<th>2012</th>
<th>4 yr total</th>
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<td>359</td>
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<td>412</td>
<td>441</td>
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### ST 371 2012 Enrollments by Program

<table>
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<tr>
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<tbody>
<tr>
<td>CS, Comp &amp; Elec Eng</td>
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<td>Other Engineering</td>
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</tr>
<tr>
<td><strong>Total</strong></td>
<td>441</td>
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</tbody>
</table>
ST 372 – Introduction to Statistical Inference and Regression

- Prerequisites: ST 371
- Term and frequency: Every Fall and Spring
- Student audience: Sophomore, Juniors and Seniors in Engineering disciplines
- Credit: 3 credits
- Recent instructors: Ana-Maria Staicu, Huixia Judy Wang, Kimberly Weems, Yichao Wu
- Background and goals: The overall goal of this course is to provide students in the engineering disciplines an overview of fundamental statistical concepts, and a basic working knowledge of the statistical techniques they are likely to encounter in those applied contexts. The software used is StatCrunch.
- Content: Statistical inference and regression analysis including theory and applications. Point and interval estimation of population parameters. Hypothesis testing including the use of $t$, chi-square and $F$. Simple linear regression and correlation. Introduction to multiple regression and one-way analysis of variance.
- Alternatives: ST370
- Subsequent courses: None

![ST 372 Enrollments](image)
## ST 372 Four-Year Enrollments by College

<table>
<thead>
<tr>
<th>College</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>4 yr total</th>
</tr>
</thead>
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<tr>
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## ST 372 2012 Enrollments by Program

<table>
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<tr>
<td>Industrial Engineering</td>
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<td>Non-engineering</td>
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<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>104</strong></td>
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</tbody>
</table>
ST 380 – Probability and Statistics for Physical Sciences

- Prerequisites: MA 241
- Term and Frequency: Every Fall
- Student audience: undergraduate students in the physical sciences
- Credits: 3 credits (credit will not be given for ST 380 and ST 361 or ST 370).
- Recent instructors: Kevin Gross, Donald Martin
- Background and goals: The goal of this class is to teach the tools of statistical data analysis, with emphasis on concepts instead of calculation. The course will be split into two units. The first unit is a mini-course in probability. The second unit will be an introduction to statistical ideas and concepts. The main emphasis of the second unit will be on the ideas and thought processes that underpin statistical data analysis.
- Content: Basic probability, random variables, descriptive statistics, sampling distributions, point estimation, interval estimation, hypothesis testing, regression
- Alternatives: None
- Subsequent courses: None

![ST 380 Enrollments](image_url)
### ST 380 Four-Year Enrollments by College

<table>
<thead>
<tr>
<th>College</th>
<th>2009</th>
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<th>2011</th>
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<th>4 yr total</th>
</tr>
</thead>
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<td>0</td>
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<td>1</td>
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<td>Physical &amp; Math Sci</td>
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### ST 380 2012 Enrollments by Program

<table>
<thead>
<tr>
<th>Program</th>
<th>2012</th>
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</thead>
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<tr>
<td>Applied Math, Math, Math Ed</td>
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<tr>
<td>Meteorology &amp; Marine Sci</td>
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<tr>
<td>Physics</td>
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<tr>
<td>Other</td>
<td>12</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>35</td>
</tr>
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</table>
14.3 Graduate Service Courses

The Statistics graduate service courses consist of the following year-long introductory sequences: ST 507-508, ST 511-512, ST 513-514 and ST 515-516. These sequences are similar in content; however, there are some differences based on the disciplines and mathematics levels of their target audiences. In addition, there are two courses which are usually completed after the ST 511-512 sequence, ST 506 (Sampling Animal Populations) and ST 524 (Statistics in Plant Science).

ST 506 covers statistical techniques pertaining to the sampling of wildlife populations. This course is offered in alternate fall semesters. There is a lab for this course. For computing, students use Program MARK and various R scripts. Enrollment is approximately 20 – 30 students per semester.

Challenges and Opportunities: ST 506 was not taught in 2010 because the main course coordinator was on leave. In 2012, a second instructor from the Fisheries and Wildlife Program, was added to this course. As a result, the instructors have considered offering this course every year beginning Fall 2013. Researchers at the Center for Marine Sciences and Technology (CMAST) and Duke University have requested ST 506 via video conferencing; however, there is some reluctance because of the extensive lab component.

ST 507-508 (Statistics for the Behavioral Sciences I and II) is a non-calculus-based sequence. The "traditional" ST507-508 student has not taken a math or statistics course recently. Thus, mathematical notation is minimized and reviewed as needed. Distance Education (DE) sections are available; however, most recently, ST 508 has been taught as a hybrid course. There is no formal lab associated with these courses. Students are expected to interpret output from statistical software packages, such as SAS and StatCrunch.

Challenges and Opportunities: ST 507 is taken by master’s and PhD students in the behavioral sciences; ST 508, on the other hand, is taken mainly by PhD students, thus the enrollments are smaller. Some program directors in the College of Education (CED) encourage their Ph.D. students to take the quantitative sequence offered in CED or Psychology instead of ST 507-508. They feel that ST 507-508 does not adequately prepare their students to apply statistical methods in an educational context. They are pleased with the preparation that ST 507-508 provides for their master’s students.

ST 511-512 (Experimental Statistics for Biological Sciences I and II) is also a non-calculus-based sequence; however, more of the underlying mathematics is explained, including matrix theory in ST 512. These courses have the largest enrollments among the graduate courses, and an additional section of ST 512 was added in 2009. Though ST 511 and ST 512 have "biological sciences" in their title, this sequence attracts students from many fields, including textiles, math education, engineering, anthropology and mathematics. ST 512 is a gateway to many other statistics courses as it teaches the core ideas of linear models and design. There is not a lab associated with ST 511; however, ST 512 has a lab component in which students learn SAS. DE sections of these courses are offered.
Challenges and Opportunities: An important ST 512 issue involves matrix theory. All current ST 512 professors teach some matrix theory; however, the amount varies. The matrix theory approach is important for Statistics graduate students as well as those who will take additional statistics courses, in particular the applied 700-level statistics courses. However, matrix theory may be intimidating for students from the College of Agriculture and Life Sciences (CALS) who are not as mathematically inclined and will take ST 512 as a terminal statistics course. Suggestions have been made to (1) develop curriculum guidelines regarding the amount of matrix theory to cover and (2) consider offering at least one ST 512 section per year that does not include matrix theory, making clear the limitations.

ST 513-514 (Statistics for Management I and Statistics for Management and Social Sciences II) is another sequence that serves primarily students in Management and the Institute for Advanced Analytics. In Fall 2012, ST 513 was offered for the first time in five years, targeting post-baccalaureate students seeking admission to the M.S. in Analytics Program. It is expected that MBA students will begin enrolling in this course as well. ST 514 focuses on basic and advanced regression techniques. Though there is not a formal lab for either course, SAS is introduced in ST 513 and used throughout ST 514. ST 513 is a DE course; both face-to-face and DE versions of ST 514 are offered. Currently, the face-to-face version of ST 514 is piggybacked with the undergraduate regression course ST 430.

Challenges and Opportunities: Some overlap exists between the target audiences of ST 508 (behavioral sciences) and ST 514 (management/social sciences). There is currently little coordination among the faculty who teach these courses. It may be possible to combine resources in order to better serve the needs of clients from these disciplines. This may be further motivated if ST430 and ST514 are split and taught separately.

ST 515-516 (Experimental Statistics for Engineers I and II) is a calculus-based sequence for graduate students in Electrical and Computer Engineering. The pace of ST 515 is much faster than that of ST 511; ST 515 covers an extensive amount of probability in the first half of the semester and the ST511 material in the second half. ST516 focuses on advanced regression techniques and experimental designs. Neither course has a lab component.

Challenges and Opportunities: Currently, ST 515-516 is the only year-long sequence that does not have DE sections. There is an opportunity to develop and deliver online content for these courses.

ST 524 focuses on the design of field experiments. Approximately 20 students enroll in this course each fall. Students use SAS during weekly lab sessions to analyze data from plant sciences.

Challenges and Opportunities: Plant Sciences faculty have requested an online version of ST 524. There have been preliminary discussions about videotaping classroom lectures. Also, there is some concern about the sustainability of ST 524. Professors who have taught ST 524 in the past are now retired, and the course is currently being taught by a professor emeritus.
ST506 – Sampling Animal Populations

- Prerequisites: ST 512
- Term and frequency: Alternate Fall Semesters
- Student audience: Graduate students in the Life Sciences, Marine, Earth and Atmospheric Sciences, Veterinary Science and the College of Natural Resources. The course is also accessible to advanced undergraduate students in ecological disciplines and statistics.
- Credit: 3 credits
- Recent instructors: Ken Pollock and Beth Gardner
- Recent texts: There is no formal text; however, a suggested reference text is *Analysis and Management of Animal Populations* (2002) Academic Press by Williams, Nichols and Conroy

- Background and goals: This course focuses on statistical methods applicable to sampling wildlife populations. Emphasis is on study design, model assumptions, and the effect on properties of estimators when assumptions fail.
- Content: counts, double sampling and multiple observers; repeated counts and mixture models, distance methods, line and point transect sampling; closed capture-recapture and removal models; open and closed mark-recapture methods; catch curves, nest survival and telemetry models; change in ratio.
- Alternatives: None
- Subsequent courses: None

---

**ST 506 Enrollments**

![Bar chart showing ST 506 enrollments from 2003 to 2012]

- 2003: 19
- 2004: 27
- 2005: 20
- 2006: 20
- 2007: 20
- 2008: 27
- 2009: 27
- 2010: 27
- 2011: 27
- 2012: 27
### ST 506 Four-Year Enrollments by Program

<table>
<thead>
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<th>4 yr total</th>
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<tr>
<td>Fish &amp; Wildlife</td>
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<td><strong>26</strong></td>
<td><strong>26</strong></td>
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</tbody>
</table>
ST 507 – Statistics for the Behavioral Sciences I
• Prerequisites: none
• Term and frequency: Every Fall and Spring
• Student audience: Graduate students in the social sciences
• Credit: 3 credits
• Recent instructors: Roger Woodard
• Background and goals: Basic introduction to methods of statistics for students who are graduate students in a variety of social sciences. The majority of these students have a great deal of anxiety for quantitative topics.
• Content: A general introduction to the use of descriptive and inferential statistics in behavioral science research. Methods for describing and summarizing data presented, followed by procedures for estimating population parameters and testing hypotheses concerning summarized data.
• Alternatives: ST 511, ST 513
• Subsequent courses: ST 508

![ST 507 Enrollments](chart.jpg)
<table>
<thead>
<tr>
<th>College</th>
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<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>4 yr total</th>
</tr>
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<td><strong>208</strong></td>
<td><strong>165</strong></td>
<td><strong>801</strong></td>
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</table>
ST 508 – Statistics for the Behavioral Sciences II

- Prerequisites: ST 507
- Term and frequency: Every Spring
- Student audience: Ph.D. students in the Social Sciences
- Credit: 3 credits
- Recent instructors: Kim Weems

Background and goals: Statistics for the Behavioral Sciences II is a non-calculus-based, second course in statistics that will assist students with the analysis of data generated from research in the social sciences. Students will learn several methods for determining the relationships between variables. Emphasis is placed on learning when to use a particular method and interpreting models and related computer output. The use of mathematical formulas and notation is minimized. A literature review, which involves creating a summary paper and presentation, allows the student to relate the course material to his/her specific discipline.

Content: simple linear regression, multiple regression, logistic regression, analysis of variance, analysis of covariance and model selection. Statistical software, such as SAS and StatCrunch, will be used.

Alternatives: ST 512, ST 514,

Subsequent courses: none
<table>
<thead>
<tr>
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ST 511 – Experimental Statistics for Biological Sciences I

- Prerequisites: ST 311 or graduate standing
- Term and frequency: Every Fall, Spring and Summer I
- Student audience: Graduate students in the biological sciences and related fields.
- Credit: 3 credits
- Recent instructors: Jessie Jeng, Tom Reiland, Jung-Ying Tzeng, Kim Weems
- Recent texts: *An Introduction to Statistical Methods and Data Analysis*, 6th Edition, by Ott and Longnecker
- Background and goals: This first course in statistics for graduate students is intended to give students a background in the statistical methods that will assist them in the analysis of data generated from research in the biological sciences. Students will learn several methods for summarizing and describing data in addition to techniques for using sample data to make inferences about a larger population. This is a non-calculus-based course.
- Content: Data collection, descriptive statistics, random variables and probability distributions, sampling distributions, inference for population means, ANOVA, multiple comparisons, categorical data, regression and correlation. Students will be introduced to statistical software; however, there is not a lab associated with this course.
- Alternatives: ST 507, ST 513, ST 515
- Subsequent courses: ST 512

![ST 511 Enrollments](image)
### ST 511 Four-Year Enrollments by College

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<thead>
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ST 512 – Experimental Statistics for Biological Sciences II

- Prerequisites: ST511
- Term and frequency: Every Fall, Spring and Summer
- Student audience: Graduate students in the life sciences
- Credit: 3 Credits
- Recent instructors: C. Arellano, H. Bondell, K. Gross, R. Moore, L. Nelson
- Recent texts: *An Introduction to Statistical Methods and Data Analysis*, 6th Edition, by Ott and Longnecker
- Background and goals: The goal of this course is to introduce statistical methods and concepts that are fundamental to analyzing data that arise in the biological sciences.
- Content: Simple and multiple regression. One- and two-factor ANOVA. Blocked and split-plot designs. Logistic regression.
- Alternatives: ST 514, ST 516
- Subsequent courses: none

### ST 512 Enrollments

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ST 513 – Statistics for Management I

- Prerequisites: Graduate standing
- Term and frequency: Every Fall
- Student audience: Post-baccalaureate students who want to enter the M.S. in Analytics program.
- Credit: 3 credits
- Recent instructors: Roger Woodard
- Recent texts: *Stats Data and Models* by De Veaux, Velleman and Bock.
- Background and goals: Basic introduction to methods of statistics for students who are applying to the M.S. in Analytics program. This course was revived to specifically address the need for students who were non-degree seeking and needed a course specifically to give them background in statistical methods. SAS is introduced.
- Content: Analysis of data to represent facts, guide decisions and test opinions in managing systems and processes. Graphical and numerical data analysis for descriptive and predictive decisions. Scatter plot smoothing and regression analysis. Basic statistical inference. Integrated use of computer.
- Alternatives: ST 507, ST 511
- Subsequent courses: ST 514
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ST 514 – Statistics for Management and Social Sciences II

- Prerequisites: ST 513 or ST 511 or ST 507
- Term and frequency: Every Fall and Spring
- Student audience: Graduate students in any field.
- Credit: 3 credits
- Recent instructors: Aric LaBarr, Peter Bloomfield
- Background and goals: Regression analysis is a flexible statistical problem solving methodology. Students will learn the about regression analysis in depth from topics on basic regression through more advanced techniques. Students will gain considerable experience working with data. Data from examples and problems in the text are provided on a CD provided with the text. Students will use SAS to do most homework assignments.
- Content: Simple linear regression, Regression analysis using linear algebra, multiple linear regression, model building techniques and strategies, variable selection techniques, common pitfalls of regression, residual analysis, logistic regression.
- Alternatives: ST 430 is an undergraduate version of the course.
- Subsequent courses: None.
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ST 515 – Experimental Statistics for Engineers I

- Prerequisites: ST 361 or graduate standing. Students taking this course will require competence in differential and integral calculus (at the level of MA141 and MA 241).
- Term and frequency: Every Fall
- Student audience: Graduate students in engineering disciplines
- Credit: 3 credits
- Recent instructors: Tom Gerig, Soumen Lahiri
- Background and goals: ST 515 covers the important aspects of probability and statistical techniques useful to engineers and researchers in other technical fields. The objective of the course is to develop an understanding and working knowledge of basic probability and statistics. Concepts, methods and applications are emphasized, rather than theory.
- Content: Event probability basics: experiments, outcomes, sample space, sample point, events, set algebra, probability, independence of events, conditional probability; One-dimensional discrete and continuous random variables: Probability distributions and density functions. Cumulative distribution functions, expectation; Functions of a random variable: distributions, expectations, and moment generating functions; Multidimensional random variables and their distributions; independence, expectation of functions of random variables, covariance, moments of linear functions; Families of discrete and continuous distribution. normal distribution; graphical and numerical descriptions; Random samples. Important sampling distributions; Statistical inference including parameter estimation and hypothesis testing; Analysis of Variance and Simple Linear Regression.
- Alternatives: ST 511
- Subsequent courses: ST 516

**ST 515 Enrollments**
### ST 515 Four-Year Enrollments by Engineering Program

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ST 516 – Experimental Statistics for Engineers II
- Prerequisites: ST 515
- Term and frequency: Every Spring
- Student audience: Graduate students in engineering disciplines
- Credit: 3 credits
- Recent instructors: Tom Gerig, Peter Bloomfield
- Background and goals: This two-semester course sequence (ST 515-516) covers aspects of probability and statistical techniques useful to engineers and researchers in other technical fields. The objective of the ST 516 is to develop an understanding and working knowledge of basic statistical inference with a strong emphasis on design and analysis of experiments. Concepts, methods and applications are emphasized, rather than theory.
- Content: Overview of design of experiments: Principles and examples; Two-sample comparative experiments: Overview of hypothesis testing. Review of sampling distributions. Comparing two means using complete randomization and paired comparisons. Comparing variances; Introduction to the analysis of variance: Single factor experiments; Some experimental designs: Completely randomized designs, randomized complete block designs and Latin square designs; Some treatment designs: Factorial designs; $2^k$ Factorial designs; Blocking and confounding in the $2^k$ factorial design; Two-Level fractional factorial designs; Linear regression.
- Alternatives: ST 512.
- Subsequent courses: Students needing more expertise in the design of experiments could take ST 711 Design of Experiments.

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ST 524 – Statistics in Plant Science

- Prerequisites: ST 512
- Term and frequency: Every Fall
- Student audience: Graduate students in Crop Science, Horticulture, Forestry, and related fields
- Credit: 3 credits
- Recent instructors: William Swallow
- Recent texts: None required, but several recommended
- Background and goals: Graduate students in the plant sciences have frequent need to understand statistics, including experiment design, for their own research, in reviewing literature, and in evaluating presentations in seminars and professional meetings. Although the focus will be on proper application of statistical tools, this requires both sufficient understanding of key theoretical underpinnings and a strong intuitive feel for the material, which this course provides. Computations are nowadays mostly done by packaged programs; this course focuses on what the experimenter needs to know in instructing the packaged program to do the correct computations.
- Content: Explores statistical techniques used in field, greenhouse, and laboratory experiments with plant material. Building on the fundamental ideas of randomization, replication and error reduction. Determining sources of variation and degrees of freedom for a variety of standard and non-standard designs; fixed versus random factors; expected mean squares. Blocking, including use of incomplete blocks. Analysis of covariance. Introduction to use of confounding and fractional replicates with factorial treatment designs. Proper use of SAS; annotated SAS output distributed and discussed.
- Alternatives: ST 711
- Subsequent courses: None
## ST 524 Four-Year Enrollments by Program

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XV. COURSE LISTING FOR UNDERGRADUATE DEGREE

Courses required for the BS degree

ST 101 Statistics by Example

**Catalog Description:** Sampling, experimental design, tables and graphs, relationships among variables, probability, estimation, hypothesis testing. Real life examples from the social, physical and life sciences, the humanities and sports.

**Course Rationale:** A special honors section of Statistics 101 is primarily used for incoming Statistics majors and as a recruiting course to expose undergraduate non-majors to statistics and convince them to become statistics majors. This section is restricted to particularly promising undergraduate students with strong quantitative skills. It concentrates less on numeric problems and more on reading and writing about interpretations of statistics, particularly the interpretation of statistics in the news media.

**Prerequisites:** None (Credit not allowed if the student has prior credit for another statistics course.) (Permission of instructor required for the honors section of 101)


**Mechanism of Course Delivery:** Course meets 2 days per week for 75 minutes in a lecture and discussion setting. No computer labs or recitations are associated with this course.

**Enrollments:** The enrollment of ST101 is driven primarily by Statistics majors and minors.

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ST 305 Statistical Methods

Catalog Description: Basic concepts of data collection, sampling, and experimental design. Descriptive analysis and graphical displays of data. Probability concepts, and expectations. Normal and binomial distributions. Sampling distributions and the Central Limit Theorem. Confidence intervals and hypothesis testing. Tests for means/proportions of two independent groups. One factor analysis of variance. Understanding relationships among variables; correlation and simple linear regression. Computer use is emphasized.

Course Rationale: This is the gateway methods course for students entering the statistics undergraduate program. Its purpose is to prepare statistics majors and minors for subsequent courses in probability, mathematical statistics, design, sampling, and regression.

Prerequisites: MA 141 (Calculus I) and either PAMS 100 or E 115 (freshman orientation)

Texts Used Recently: Introduction to the Practice of Statistics, 7th edition, by David Moore and George McCabe

Mechanism of Course Delivery: One section taught each semester, typically as four 50-minute lectures and one 50-minute problem session per week.

Enrollments: The enrollment in ST305 has remained relatively steady since its inception in 2009. The students in the course are approximately 50% statistics majors and then a mix of other students seeking a minor. The course also has substantial numbers of students from Mathematics Education.

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</table>
ST421-422 Introduction to Mathematical Statistics I and II

Course Description:
ST421: First of a two-semester sequence of mathematical statistics, primarily for undergraduate majors and graduate minors in Statistics. Introduction to probability, univariate and multivariate probability distributions and their properties, distributions of functions of random variables, random samples and sampling distributions.

ST422: Second of a two-semester sequence of mathematical statistics, primarily for undergraduate majors and graduate minors in Statistics. Random samples, point and interval estimators and their properties, methods of moments, maximum likelihood, tests of hypotheses, elements of nonparametric statistics and elements of general linear model theory.

Prerequisites:
ST421: MA242 (Calculus III)
ST422: ST421


Mechanism of Course Delivery: A single section of ST421 is taught each fall semester by a faculty member. A single section of ST422 is taught the following spring semester, generally by the same instructor who taught ST421. Both courses are taught in lecture format with heavy homework requirement.

Enrollments: The enrollment in ST421 and ST422 has spiked recently. This source of this spike is partially an increase in statistics undergraduates and overall general increase. We have recently begun offering the sequence in summer sessions.

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<td>2008-2009</td>
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</table>
ST430: Introduction to Regression Analysis  
ST514: Statistics for Management and Social Sciences II  

Course Descriptions:  

ST430: Regression analysis as a flexible statistical problem solving methodology. Matrix review; variable selection; prediction; multicollinearity; model diagnostics; dummy variables; logistic and non-linear regression. Emphasizes use of computer.  

ST514: Linear regression, multiple regression and concepts of designed experiments in an integrated approach, principles of the design and analysis of sample surveys, use of computer for analysis of data.  

Prerequisites:  
ST430: ST305 and MA405 (Linear Algebra)  
ST514: ST507 (Statistics for the Behavioral Sciences I)  


Mechanism of Course Delivery: ST430 and ST514 have been taught as one course (one room, one instructor, identical requirements) for the past several years. The course is offered in the fall semester each year using a standard lecture format.  

Enrollments: The combined enrollment in ST430 and ST514 is consistently larger than 50 students.  

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<td>2008 Fall</td>
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</table>
ST431 Introduction to Experimental Design

**Catalog Description:** Experimental design as a method for organizing analysis procedures. Completely randomized, randomized block, factorial, nested, Latin squares, split-plot and incomplete block designs. Response surface and covariance adjustment procedures. Stresses use of computer.


**Mechanism of Course Delivery:** This course is offered in the spring semester each year using a standard lecture format.

**Enrollments:** The enrollment of ST431 is driven primarily by enrollment of Statistics majors and minors.

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</table>

ST432 Introduction to Survey Sampling

**Course Catalog Description:** Design principles pertaining to planning and execution of a sample survey. Simple random, stratified random, systematic and one- and two-stage cluster sampling designs. Emphasis on statistical considerations in analysis of sample survey data. Class project on design and execution of an actual sample survey.

**Texts Used Recently:** Lohr, S., *Sampling: Design and Analysis.* Schaeffer, R., Mendenhall, W. and Ott, L. *Elementary Survey Sampling.*

**Mechanism of Course Delivery:** This course is offered in the spring semester each year using a standard lecture format.

**Enrollments:** The enrollment of ST432 is driven primarily by enrollment of Statistics majors and minors.

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ST435 Statistical Methods for Quality and Productivity Improvement  
ST 535 Statistical Process Control

**Course Catalog Description:** Use of statistics for quality control and productivity improvement. Control chart calculations and graphing, process control and specification; sampling plans; and reliability. Computer use will be stressed for performing calculations and graphing.


**Mechanism of Course Delivery:** ST435 and ST535 have been taught as one course (one room, one instructor, identical requirements) for the past several years. The course is offered in the fall semester each year using a standard lecture format.

**Enrollments:** The enrollment of ST435 is driven primarily by enrollment of Statistics majors and minors. ST535 has some Statistics masters students but often serves master’s degree students from the College of Engineering and the College of Textiles.

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</table>
ST445 Introduction to Statistical Computing and Data Management

Catalog Description: Use of computers to manage, process and analyze data. Concepts of research; data management; JCL and utility programs; use of statistical program package for data analyses and graph production; and writing statistical programs to perform simulation experiments. Major paper required.


Mechanism of Course Delivery: This course is offered in the spring semester each year using a modified lecture format that makes use of the computing resources. It is taught in the Statistical Instructional Computing Lab (SICL).

Enrollments: The enrollment of ST445 is driven primarily by enrollment of Statistics majors and minors. There is a demand for non-majors who wish to take the course but it is limited by the seats in the SICL. Beginning in summer 2012 we began offering ST445 in the summer.

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XVI. GRADUATE COURSE LISTING

Course Title: ST 521 – Statistical Theory I

Prerequisites: MA 511 and MA 425

Term & Frequency: Every fall

Student Audience: Master or PhD students in Statistics and related fields.

Credits: 3

Recent Instructors: Hao Helen Zhang, Wenbin Lu, Huixia Judy Wang

Recent Texts: Statistical Inference 2\textsuperscript{nd} edition, by George Casella and Roger L. Berger.

Background and Goals: A primary objective of the ST 521 course is to present techniques and basic results of probability and convergence theory at a rigorous and advanced calculus level.

Content: In ST 521 we develop the probabilistic tools and language of mathematical statistics. The course describes basic probability theory, probabilistic models for and properties of random variables, common probability distributions for univariate and multivariate random variables, and sampling distributions and convergence theory.

Alternatives: None

Subsequent Courses: ST 522, ST 793, ST 794

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</table>
Course Title: ST 522 - Statistical Inference II

Prerequisites: ST 521

Term & Frequency: Every Spring

Student Audience: Graduate Students in Statistics and related fields

Credits: 3

Recent Instructors: Howard Bondell, Montse Fuentes, Donald Martin, Hao Helen Zhang

Recent Text: Statistical Inference, by Casella and Berger

Background and Goals: There are two sections of this course. One is for graduate students in statistics; the other is for students in other disciplines. This course is designed to provide the basic tools of statistical inference to graduate students. It should prepare the students to understand the foundations behind statistical inference, and enable them to formulate appropriate statistical procedures. It should further hone their problem solving skills, as well as prepare them to handle more advanced courses.

Content: Sufficient, ancillary, and complete statistics; Methods of finding estimators, including maximum likelihood; Mean squared error and unbiasedness; Hypothesis testing, including likelihood ratio; Power functions; Neyman-Pearson Lemma; Uniformly most powerful tests; Confidence intervals; Asymptotic properties of estimators and tests.

Alternatives: None

Subsequent Courses: Advanced Inference (ST 793) for Statistics PhD students

### Spring Semester

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</table>
Course Title: ST 552 - Linear Models and Variance Components

Prerequisites: MA 405 (Linear Algebra), ST 512, ST 521, ST 522 (co-requisite)

Term & Frequency: Every fall

Student Audience: Statistics MS and PhD students, and other graduate students needing a thorough understanding of the theory of linear models.

Credit: 3

Recent Instructors: L. Stefanski, J. Monahan


Background and Goals: The course covers the theory underlying linear statistical models, and provides the necessary theoretical foundation for understanding many advanced statistical methods and for doing methodological research in statistics.

Content: General linear model; review of linear algebra; generalized inverses; solving linear equations; projections; linear least squares and the normal equations; estimability; Gauss-Markov Theorem; generalized least squares; multivariate normal distribution; central and non-central Chi-squared and F distributions; distributions of quadratic forms; general linear hypothesis; linear models with random effects; variance components

Alternatives: ST 708 (for students requiring only familiarity with linear model methodology)

Subsequent Courses: ST 793, all other advanced courses in Statistics

Fall Semester

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</table>
Course Title: ST 708 - Applied Least Squares

Prerequisites: ST 512, and familiarity with matrix algebra

Term & Frequency: Every Fall

Student Audience: Graduate Students in Statistics and related fields

Credit: 3

Recent Instructors: Howard Bondell, Jacqueline Highes-Oliver

Recent Texts: Applied Regression Analysis: A Research Tool, by Rawlings, Pantula, and Dickey

Background and Goals: This course is designed to give a rigorous, yet applied, background in linear regression to students in quantitative disciplines. The course will go into detail on the foundations of regression both from an algebraic and geometric point of view. Linear regression models will be viewed from a unified framework via the matrix formulation of the linear model. Diagnostics and modeling techniques will be discussed. SAS software will be used throughout the course both to demonstrate the concepts as well as to complete the homework assignments.

Content: Simple linear regression; Multiple regression; Matrix formulation for regression; Analysis of Variance; Distributions of quadratic forms; Testing the general linear hypotheses; Variable selection; Diagnostics; Transformations; Generalized least squares

Alternatives: None

Subsequent Courses: None

Fall Semester

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</table>
Course Title: ST 711 - Experimental Design

Prerequisites: ST 512

Term & Frequency: Every Fall

Student Audience: Graduate students from any discipline wanting to design experiments.

Credit: 3

Recent Instructors: D. A. Dickey, J. A. Osborne


Background and Goals: As background, students should understand completely randomized designs and the concept of blocking. An understanding of how linear regression works, especially in terms of matrix computations, is extremely helpful as background. Coming out of the course the student should understand the many different kinds of blocked designs, complete and incomplete, Latin squares, split plots, repeated measures, etc. (see list below) and the role of random effects in their analysis.


Alternatives: None

Subsequent Courses: ST 524, ST 641, ST 755

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Course Title: ST 715 - Theory of Sampling Applied To Survey Design

Prerequisites: ST 422 (or ST 522), ST 512

Term & Frequency: Every Fall

Student Audience: Graduate students in Statistics and related fields

Credit: 3

Recent Instructors: Dennis Boos

Recent Text: Sampling: Design and Analysis, second edition, 2010, Sharon Lohr

Background and Goals: This course is designed to introduce the basic theory and methods of finite population sampling. It prepares the student to design and analyze standard surveys and data collection based on probability sampling. Some background in statistical theory is required because variance calculations can be lengthy and nontrivial

Content: Simple random sampling, Stratified sampling, Ratio and regression estimation, Cluster sampling, and Unequal probability sampling.

Alternatives: None

Subsequent Courses: None

Fall Semester

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Course Title: ST 721 - Genetic Data Analysis

Prerequisites: None

Term & Frequency: Spring semester every other year

Student Audience: Majority is for statistics, genetics and bioinformatics

Credit: 3

Recent Instructors: Jung-Ying Tzeng, Dahlia Nielsen

Recent Text: None for JYT; before the class used “Weir BS (1996) Genetic data analysis II. Sinauer Associates, Sunderland, MA.”

Background and Goals: The course is designed to equip students with the fundamental knowledge and tools in statistics and bioinformatics for conducting genetic data analysis

Content: Introduction of genetic markers, individual identification (genetic identity coefficients and its applications), Hardy-Weinberg disequilibrium, allele frequency estimation, recombination, genetic map function, linkage analysis, linkage disequilibrium; haploview, association analysis: family-based design vs. population-based design, single- vs. multi-marker analysis; multiple testing; quality control; plink; genome browser; population substructures; association analysis with next-generation sequencing data

Alternatives: None

Subsequent Courses: None

Spring Semester

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Course Title: ST 730 - Applied Time Series Analysis

Prerequisites: ST 512. This course requires two semesters of statistical methods, normally ST 511-512. Students will be expected to be familiar with basic statistical ideas.

Term & Frequency: Every Fall

Student Audience: Graduate students in Statistics and graduate students in other quantitative fields who plan to work with time series data

Credit: 3

Recent Instructors: Peter Bloomfield

Recent Text: Time Series Analysis and Its Applications, 3rd edition, by Robert H. Shumway and David S. Stoffer; Springer. (The 2nd edition may also be acceptable.)

Background and Goals: The goal of this course is to introduce the student to the most important methods for analyzing time series data, from both the time domain and frequency domain perspectives.

Content: Exploratory analysis of time series; Time domain methods, such as ARIMA models; Frequency domain methods, including periodogram and spectrum analysis, filtering, and transfer functions; Transfer function modeling in the time domain; Further topics, such as long memory and conditional heteroscedasticity models

Alternatives: None

Subsequent Courses: ST 782 and ST 783 develop the underlying theory of time domain and frequency domain methods, respectively.

Fall Semester

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</table>
Course Title: ST 731 - Applied Multivariate Statistical Analysis

Prerequisites: ST 512

Term & Frequency: Every Spring

Student Audience: MS and PhD students (both statistics and non-stat majors)

Credit: 3

Recent Instructors: Arnab Maity, Lexin Li


Background and Goals: An introduction to use of multivariate statistical methods in analysis of data collected in experiments and surveys. Students will (a) be capable of selecting, carrying out and interpreting appropriate statistical methods for describing and analyzing multivariate data sets, in the context of their own research interests; (b) have an appreciation of a range of multivariate methods and their use and limitations in a research context; (c) be able to examine critically their own and other researchers’ use of methods of analysis for multivariate data. Emphasis upon use of a computer to perform multivariate statistical analysis calculations.

Content: Multivariate normal distribution, Inferences about a mean vector, Comparison of several multivariate means, Principal components analysis, Factor analysis, Canonical correlation analysis, Discrimination and classification, Clustering

Alternatives: None

Subsequent Courses: None

Spring Semester

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</table>
Course Title: ST 732 - Applied Longitudinal Data Analysis

Prerequisites: ST 512, Experimental Statistics for Biological Sciences II, or equivalent. Students are expected to have had some exposure to the use of SAS. Familiarity with matrix algebra is advantageous.

Term & Frequency: Every Spring

Student Audience: PhD students in Statistics and related fields

Credit: 3

Recent Instructors: Marie Davidian, Dennis Boos, Wenbin Lu

Recent Text: Lecture notes prepared by Marie Davidian

Background and Goals: The course is meant to be accessible both to non-majors and majors. The underlying mathematical theory will not be stressed, and the main focus will be on concepts and applications.

Content: The topics covered include classical methods for normally distributed repeated measurements, methods for non-normally distributed unbalanced data, generalized estimating equations, generalized linear mixed effects models.

Alternatives: None

Subsequent Courses: None

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</table>
Course Title: ST 733 - Applied Spatial Statistics

Prerequisites: ST 512

Term & Frequency: Every spring

Student Audience: Graduate students in Statistics and related fields

Credit: 3

Recent Instructors: Brian Reich, Montse Fuentes


Background and Goals: The course covers the fundamental concepts used for analysis of geostatistical, areal, and point-pattern spatial data. Analysis using existing software is emphasized, and the statistical techniques are illustrated using environmental, geological and agricultural data.

Content: Variogram models; Spatial regression; Kriging; Gaussian Markov random fields; Simultaneous autoregressive models; Moran and Geary tests; Poisson processes.

Alternatives: None

Subsequent Courses: ST 810, Spatial Statistics

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</table>
Course Title: ST 740 - Bayesian Inference

Prerequisites: ST 522

Term & Frequency: Every Fall

Student Audience: Graduate students in statistics and related fields

Credit: 3

Recent Instructors: Brian Reich, Sujit Ghosh

Recent Text: Christensen, Johnson, Branscum, Hanson (2011). Bayesian Ideas and Data Analysis. Chapman & Hall/CRC

Background and Goals: Introduction to Bayesian inference; specifying prior distributions; conjugate priors, summarizing posterior information, predictive distributions, hierarchical models, asymptotic consistency and asymptotic normality. Markov Chain Monte Carlo (MCMC) methods and the use of existing software (e.g., WinBUGS)

Content: Prior distributions; Empirical Bayesian methods; Objective Bayes priors; Bayes rules; Gibbs sampling; Metropolis-Hastings sampling; Bayes factors; Semiparametric Bayesian methods; Model diagnostics.

Alternatives: None

Subsequent Courses: ST 790, Advanced Bayesian Inference

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Course Title: ST 744 - Categorical Data Analysis

Prerequisites: ST 512, ST 522

Term & Frequency: Every Spring

Student Audience: Graduate students in Statistics and related fields

Credit: 3

Recent Instructors: Daowen Zhang

Recent Text: Categorical Data Analysis, second edition, by Agresti

Background and Goals: This course will cover statistical models and methods appropriate for analyzing categorical responses. Special attention will be paid to the analysis of contingency tables, logistic and Poisson regressions, and their extension generalized linear models. Models for repeated categorical data will also be introduced. Asymptotic as well as exact methods and their implementation using statistical software SAS will be discussed.

Content: Type of categorical data, multinomial distribution, contingency tables, Pearson Chi-square test, Fisher’s Exact test, Mantel-Haenszel test, Cochran-Armitage trend test, independence and conditional independence, Simpson’s paradox, generalized linear models, logistic and Poisson regression models, matched paired studies, McNemar test, conditional logistic regression model and random effects logistic model for data from matched paired studies, models for multinomial data.

Alternatives: None

Subsequent Courses: None

Spring Semester

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Course Title: ST 745 - Applied Survival Analysis

Prerequisites: ST 521, ST 522, ST 552

Term & Frequency: Every spring

Student Audience: PhD Students in statistics and related fields

Credit: 3

Recent Instructors: Eric Laber, Wenbin Lu, Daowen Zhang, Butch Tsiatis

Recent Text: Moeschberger and Klein, Survival Analysis, Butch Tsiatis' notes

Background and Goals: This course provides an introduction to parametric and nonparametric methods in survival analysis. This course serves the dual purpose of preparing students to analyze time-to-event data as well as to prepare them for advanced study or research in survival analysis.

Content: Censoring, Kaplan-Meier estimator and Greenwood's formula, log-rank tests, regression models and diagnostics, including Cox proportional hazards and accelerated failure time models, competing risks and multistate models as time permits

Alternatives: None

Subsequent Courses: Advanced survival analysis

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Course Title: ST 755 - Advanced Analysis of Variance and Mixed Models

Prerequisites: ST 522, ST 732

Term & Frequency: Every other Spring

Student Audience: Ph.D students interested mixed model methodology

Credit: 3

Recent Instructors: Daowen Zhang

Recent Text: None

Background and Goals: This special topic covers theories of linear mixed models and generalized linear mixed models, including the estimation and inference of the fixed effects, random effects and variance components; it also covers variance components tests in mixed model, connection of mixed models and nonparametric regression and methods for relaxing random effects distribution.

Content: Linear mixed models, BLUEs/BLUPs, large-sample and small-sample inference for fixed effects, estimation and inference of variance components; Generalized linear mixed models, Laplace approximation, PQL, bias correction for fixed effects and variance components; Variance components testing; Mixed effect representation of smoothing spline estimate of a nonparametric function; Conditional inference for mixed models, flexible distribution of random effects in mixed models.

Alternatives: None

Subsequent Courses: None

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Course Title: ST 758 - Computing for Statistical Research

Prerequisites: ST522, ST552

Term & Frequency: Every Fall

Student Audience: PhD students in Statistics and related fields

Credit: 3

Recent Instructors: John Monahan, Hua Zhou

Recent Text: Numerical Methods of Statistics, second edition, by Monahan

Background and Goals: This course is designed to prepare graduate students for numerical work in research in statistics and related areas. The computer language of instruction is R; some basic programming tools in R, including functions, will be covered. Homework’s will involve both analysis and computation in R; one will be a project involving a simulation experiment.

Content: Computer arithmetic, basics of R, solving linear equations, Cholesky factorization, regression computations, eigen problems, functions in R, optimization, numerical integration, random number generation, design and analysis of statistical simulation experiments.

Alternatives: Numerical linear algebra covered by MA428; discrete event simulation offered in CSC/ISE/OR 762

Subsequent Courses: None

Fall Semester

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</table>
Course Title: ST 762 - Statistical Models for Univariate and Multivariate Response

Prerequisites: ST 512R Experimental Statistics for Biological Sciences II; ST 552, Linear Models and Variance Components; Familiarity with SAS or R and a scientific computing language (e.g. MATLAB, FORTRAN)

Term & Frequency: Every Fall

Student Audience: Doctoral and advanced Master's students in Statistics, or students in other fields.

Credit: 3

Recent Instructors: Peter Bloomfield, Marie Davidian

Recent Text: Dr. Davidian's notes

Background and Goals: This course will provide a detailed treatment of regression models and associated inferential methods both for univariate and multivariate (e.g. repeated measures) response. The techniques to be discussed are now an essential part of the modern statistician’s toolkit and are widely used in numerous application areas. The first 1/2 to 2/3 of the course will focus on nonlinear regression models for univariate response, including models for nonconstant response variance. The remainder of the course will be devoted to introduction to extension of the univariate model to two popular types of nonlinear regression models for multivariate response: (i) “population-averaged” models and models for covariance structure will be discussed; methods for fitting these models are popularly known in the literature as “generalized estimating equations,” and (ii) “subject-specific” models, e.g., generalized linear and nonlinear mixed effects models. Properties of competing inferential techniques and the effects of model misspecification will be studied via theoretical arguments carried out at a nonrigorous, heuristic level and via simulation exercises on the part of students. Although we will go through theoretical arguments in class in some detail, and students will be expected to understand and be able to carry out similar arguments at the same level, our main objective will be to appreciate the implications of the results for practice rather than the technical details. Implementation of the methods and application to data will be emphasized in the homework assignments.

Nonlinear and generalized linear mixed effects (subject-specific) models – approximate and “exact” methods.

Alternatives: None

Subsequent Courses: None

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Course Title: ST 779 - Measure Theory and Advanced Probability

Prerequisites: MA 425 or MA 511 or equivalent, and ST 521 (or equivalent).

Term & Frequency: Every Fall

Student Audience: Ph.D. Students in Statistics and Related Fields

Credit: 3

Recent Instructors: Subhashis Ghoshal

Recent Text: A Probability Path by Sidney Resnick, Birkhauser

Background and Goals: This course is designed to train graduate students on theoretical foundations of probability theory, integration techniques and properties of random variables and their collections. Techniques learned from this course play important roles in statistical inference and all branches of mathematical statistics. Homework will involve application of the theorems taught in the course in more concrete contexts.

Content: Classes of events, random variables, probability measures, integration and expectation, inequalities, Lp-spaces, product spaces, independence, zero-one laws, convergence notions, characteristic function, simplest limit theorems, absolute continuity, conditional expectation and conditional probability, martingale theory, applications of martingale techniques in limit theorems.

Alternatives: MA/ST 747 covers many overlapping topics, but is not generally offered

Subsequent Courses: ST 790, Asymptotic Statistics, among other things, covers weak convergence and empirical process theory that can be regarded as follow up.

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Course Title: ST 782 - Time Series Analysis: Time Domain

Prerequisites: ST 512 and ST 522

Term & Frequency: Spring (every two years)

Student Audience: Graduate students in statistics and other fields

Credit: 3

Recent Instructors: Donald Martin

Recent Text: None

Background and Goals: In this class we study fundamental tools and concepts for time series analysis in the time domain. Models for stationary and nonstationary univariate series are examined, as well as estimation inference for coefficients of models. Autocorrelation and partial autocorrelation and their use in identification of time series models are considered. Extensions are given to multivariate series.

Content: Stationarity, autocorrelation, partial autocorrelation function, autoregressive moving average (ARMA) processes, vector processes, prediction, order in probability, convergence, central limit theorems, estimation of ARMA models, ARIMA models and other nonstationary and seasonal models, regression with time series errors, ARCH models.

Alternatives: None

Subsequent Courses: None

Spring Semester

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Course Title: ST 783 - Time Series Analysis: Time Frequency Domain

Prerequisites: ST 512 and ST 522

Term & Frequency: Spring (every two years)

Student Audience: Graduate students in statistics and other fields

Credit: 3

Recent Instructors: Donald Martin, Peter Bloomfield

Recent Text: Fourier Analysis of Time Series by Peter Bloomfield

Background and Goals: The student will understand the theory underlying frequency domain methods of analyzing time series

Content: Regression with sinusoids, harmonic analysis and the FFT, complex demodulation, spectrum analysis, sampling theory, multiple time series. Other topics will be covered as time allows.

Alternatives: None

Subsequent Courses: None

Spring Semester

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Course Title: ST 793 - Advanced Statistical Inference

Prerequisites: ST 522

Term & Frequency: Every Spring

Student Audience: Graduate students in Statistics and related fields

Credit: 3

Recent Instructors: Dennis Boos, Len Stefanski

Recent Text: Essential Statistical Inference: Theory and Methods, 2012, Boos and Stefanski

Background and Goals: This course is for students who have had a first year graduate level mathematical statistics course. It prepares them to handle statistical inference in a wide range of problems at an advanced level.

Content: The course covers classical likelihood, Bayesian, and permutation inference; an introduction to basic asymptotic analysis; and modern topics like M-estimation, the jackknife, and the bootstrap. R code is woven throughout.

Alternatives: None

Subsequent Courses: Advanced statistics courses such as ST 762, ST 782-4 and special topics ST 790 courses such as Asymptotic Statistics, Advanced Bayesian Methods, and Modern Nonparametric Methods

Semester

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<th>Term</th>
<th>2003 Fall</th>
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<th>2005 Fall</th>
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XVI. SPECIAL TOPICS COURSES

While the Department of Statistics offers a wide variety of courses at the graduate level, we also regularly offer special topics courses. These courses are often courses offered on an experimental basis until they prove to be viable as a permanent course. Others may be one-time offerings, or an opportunity for new faculty to present a new research area to potential students (and also to faculty). These courses are critical for a graduate program to allow the course offerings to grow and change with the discipline. Special topics courses are taught at two levels and in two ways. The ST590 and ST610 are used for courses at the Master’s level; ST790 and ST810 are used at the PhD level. The distinction between these pairs is grading: S/U for ST610 and ST810 and the usual letter grades for ST590 and ST790.

Some of the courses have been taught on a regular basis for a few years and the paperwork for establishing them as permanent courses has not been processed. While inertia may admittedly be one of reasons, sometimes administrative issues on course ownership may not have been resolved. In cases when only one instructor may be qualified to teach the course, establishing a permanent course would be imprudent.

For this discussion, these courses are placed into three groups:

1) courses that have been offered more than a few times, perhaps destined to become permanent courses
2) core option courses that are key to the current PhD curriculum but not yet permanent courses
3) one-time or irregularly offered courses on a new area of research

each group will be discussed in turn.

Group 1: Regularly offered but not yet permanent

Bioinformatics I and II taught as ST590 by Dr. Stone (I) and Dr. Thorne (II), respectively.

   I. This introductory course provides a broad overview of biological sequence analysis for students who will take additional courses in statistical genetics, bioinformatics and computer science. At the end of the course, students should have an appreciation of the basic problems facing genomic scientists, the role that bioinformatics plays in the solution of these problems, a basic understanding of bioinformatics methodologies, and skills using key genomic science computer equipment.

   II. This course introduces students to statistical and computational techniques that are important for the analysis of DNA and protein data. Students will gain experience in implementing these techniques and will be exposed to the challenges that arise when statistical inference is performed with biologically plausible models that are computationally demanding.
Applied Data Mining, taught as ST610 by Dr. Dickey
Overview of data mining, Creating data mining diagrams, Classification Trees and Regression Trees, Discriminant Analysis, Ordinary and Logistic Regression, Neural Networks, Evaluation Methods - ROC etc., Clustering, Association Analysis

Bioinformatics Consulting, taught as ST610 (2 hrs) by Dr. Motsinger
Bioinformatics is a field driven by data. This dependence makes communication with experimentalists essential, and at the same time experimentalists rely on bioinformaticians for their expertise. In this course, students will gain experience in bioinformatics consulting. With faculty guidance, students are expected to interact with client(s) and (1) understand the objectives the client is trying to address, (2) work out an appropriate bioinformatics approach for the objective, (3) produce a written summary of the methods implemented and the results obtained, and (4) present an oral presentation of the methods and results.

Ethics in Statistics, taught as ST610 (1 hr) by Dr. Muse
Research ethics is increasingly recognized as a subject to be treated formally in graduate education. While several courses in research ethics are available on campus, they are primarily focused on laboratory sciences. The field of statistics includes a unique set of ethical and professionalism issues that are not adequately covered by those courses. This course has been designed to complement PHI 816: Research Ethics, which will be a prerequisite for this course (corequisite, since they can be taken in the same semester?). Dr. Gary Comstock, the instructor and developer of PHI 816, has contributed to the design of ST 810E. Upon completion of PHI 816, students in ST 810E will explore ethical issues surrounding to the statistical analysis of data, including objectivity, abuse and misuse of statistical methodology, and experimental design. In addition, general topics such as authorship and plagiarism will be explored in additional depth, with attention given to the nuances found in statistical practice. The professional behavior of the statistical consultant will be emphasized throughout the course. This course will also play an essential role by meeting the stringent research ethics requirements for federally funded training programs.

Computational Data Analysis, taught as ST590 by Dr. Monahan
Simulation tools in SAS: BY and ODS, Text/data parsing and analysis, macros and macro loops, Automated data extraction, regular expressions, SQL

Preparation for Research, taught as ST810 (1 hr)(often referred to as ST810A) by various faculty
This course is meant to give students pursuing a Ph.D. in Statistics an organized introduction to the necessary skills and knowledge for a career in statistical research, starting with the first formal research activity, the dissertation. Course topics and class format (lecture, panel discussion, etc.) will vary from week to week, as described below.

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Group 2: Core Option Courses

The Core Option courses, required in the PhD curriculum, form the second group. These arose from the viewpoint that the field of statistics is growing on a broad front. In the last revision of the PhD curriculum, we reduced the required inference course to one semester, to just the topics that all doctoral students need. But, to prepare students for one of these broad new areas of statistical research, we now require one of these three Core Options: Asymptotic Statistics, Nonparametric Regression and Smoothing, and Advanced Bayesian Analysis. The course descriptions follow with the enrollment data.

ST790 Nonparametric Regression and Smoothing

Nonparametric regression and smoothing methods offer the art of curve estimation by relaxing the linear assumption in regression models. Their local structure and great flexibility allow the data to discover the hidden nonlinear pattern objectively. This course aims to give a thorough overview of a variety of smoothing and nonparametric regression methodologies, with emphasis on both theoretical and computational aspects. Both classical and modern techniques are introduced for problems of regression, classification, density and hazard rate estimation. The main topics include regression and smoothing splines, kernel smoothers, generalized additive models, and other regularization techniques such as support vector machines (SVMs), a popular tool in data mining. Special treatment is given to important issues like parameter tuning and model selection. The course demands a moderate amount of programming with R language for data analysis. Various real datasets are be used in class and homework. After this course, the students are expected to get familiar with common smoothing techniques and gain hand-on experience with popular software and packages.

Prerequisites: ST 522 and ST552; ST758 recommended

ST790 Asymptotic Statistics

Course hours, TH 4:30-5:45, SAS 1108
Text: Asymptotic Statistics by A. W. van der Vaart
Course requirement (credit): Class, homework, written midterm, midterm project, final project (no written final exam)
Audit requirement: Class, homework (at least 70% score required for passing grade).

Outline of topics to be covered (from the list below, as time permits):

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Department of Statistics Self-Study Report
1. Asymptotic normality, Delta method, variance stabilizing transformation, higher order corrections
2. Efficiency of estimators, Fisher's conjecture, super-efficiency
3. Contiguity
4. Local asymptotic normality, differentiability in quadratic mean, nonregular models
5. Modern theory of asymptotic efficiency, regularity, convolution theorem, local asymptotic minimaxity
6. Convergence of experiments
7. Hoffmann-Jorgensen weak convergence theory, continuous mapping theorem, asymptotic tightness, weak convergence in L-infinity
8. Empirical process, classical Glivenko-Cantelli and Donsker theorem, entropies, VC classes, maximal inequalities, abstract Glivenko-Cantelli and Donsker theorems, applications of empirical process theory
9. M-estimators, Z-estimators, robust estimation, Wald's method for consistency of MLE, argmax theorem, asymptotic normality of M and Z-estimators, quantiles, mean absolute deviation and other nonregular estimators
10. Projection, Hajek decomposition
11. U-statistics, Hoeffding decomposition
12. Extremes and order statistics, L-statistics
13. Functional delta method, von Mises calculus, Hadamard differentiability, some common applications
14. Elements of semiparametric theory

**ST 790: Advanced Bayesian Inference**

Prerequisite: ST 522 or ST 740 (758 recommended)

Course requirement (credit): Class, homework, midterm project report, final project report and presentation (no in-class midterm and final exams)

Audit requirement: Class, homework (at least 80% score required for passing grade).

Course Description:
The essence of Bayesian methods is based on the concept of updating evidence using formal probabilistic rules. This course will begin with a discussion of foundational issues, and then progress to its use as a general paradigm for statistical methodology. Recent developments of computational tools have brought Bayesian treatment of realistic, complex problems within the reach of practicing statisticians. Some of the more specialized computational techniques will be discussed as well as their implementation for important applications. In recent years substantial progress has been made in developing a theory for infinite dimensional models and toward the implementation of the Bayesian computational methods for variable dimensional models. This course will illustrate a variety of theoretical and computational methods, simulation techniques, and hierarchical models suitable for analyzing independent and correlated data. The three broad
topics on the course include (i) Monte Carlo methods based on Markov Chain theory, (ii) Bayesian large sample methods and (iii) Bayesian nonparametric models.

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</tr>
</tbody>
</table>

**Group 3: New Research**

The last group of courses include one-time or irregularly offered courses on a new area of research. These courses bring graduate students and potential advisees to the frontier of research, and, as such, are the lifeblood of any doctoral program. A list of course offerings follows on the next page. In order for students to have the opportunity for some selection in their research areas, we aim to offer three to five courses each semester, owing to the size and breadth of the program. However, this goal has not been achievable at times, owing to faculty workload. While SAMSI workshops offer a natural opportunity for exposure to new research areas, perhaps owing to logistics, enrollment in these as courses for graduate students has never been high.

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course</th>
<th>Title</th>
<th>Instructor</th>
<th>Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring 2013</td>
<td>ST810</td>
<td>Statistics and Financial Risk</td>
<td>Bloomfield</td>
<td>27</td>
</tr>
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<td></td>
<td>ST810</td>
<td>Advanced Statistical Computing</td>
<td>Hua/Laber</td>
<td>30</td>
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<tr>
<td></td>
<td>ST810</td>
<td>Breakthroughs in Statistics</td>
<td>Stefanski</td>
<td>15</td>
</tr>
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<td></td>
<td>ST810</td>
<td>Causal Inference</td>
<td>Tsiatis</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>ST810</td>
<td>High Dim &amp; Mass Data</td>
<td>Ipsen</td>
<td>2</td>
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<tr>
<td>Fall 2012</td>
<td>ST790</td>
<td>Adv Surviv Analy</td>
<td>Lu</td>
<td>7</td>
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<td>ST810</td>
<td>Functional Data Analysis</td>
<td>Arnab/Staicu</td>
<td>23</td>
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<tr>
<td></td>
<td>ST810</td>
<td>Spatial Statistics</td>
<td>Fuentes/Mannshardt</td>
<td>13</td>
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<tr>
<td>Spring 2012</td>
<td>ST810</td>
<td>Num Meth for Uncert Quant II</td>
<td>Gremaud (SAMSI)</td>
<td>2</td>
</tr>
<tr>
<td>Fall 2011</td>
<td>ST810</td>
<td>Num Meth for Uncert Quant II</td>
<td>Gremaud (SAMSI)</td>
<td>2</td>
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<tr>
<td></td>
<td>ST810</td>
<td>Measurement Error Models</td>
<td>Stefanski</td>
<td>24</td>
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<tr>
<td>Spring 2011</td>
<td>ST790</td>
<td>Causal Inference</td>
<td>Tsiatis</td>
<td>19</td>
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<tr>
<td></td>
<td>ST790</td>
<td>Analysis of Object Data II</td>
<td>Gremaud (SAMSI)</td>
<td>2</td>
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<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Instructor</td>
<td>Credits</td>
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<tr>
<td>ST790</td>
<td>Infectious Disease Modeling</td>
<td>Lloyd</td>
<td>2</td>
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<td>Fall 2010</td>
<td>ST810 Analysis of Object Data II</td>
<td>Gremaud (SAMSI)</td>
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<td></td>
<td>ST810 Complex Networks: Theory &amp; App</td>
<td>Gremaud (SAMSI)</td>
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<td>Spring 2010</td>
<td>ST610 Introduction to R</td>
<td>Reif</td>
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<td>ST790 Theory of Data Mining</td>
<td>Zhang, H.</td>
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<td>ST790 Bayesian Biostat</td>
<td>Ghosh</td>
<td>3</td>
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<tr>
<td></td>
<td>ST810 Spatial Statistics</td>
<td>Fuentes</td>
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<tr>
<td>Fall 2009</td>
<td>ST790 Dimension Reduction Methods</td>
<td>Li</td>
<td>13</td>
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<td></td>
<td>ST810 Math Stat Model</td>
<td>Banks/Davidian</td>
<td>6</td>
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<td></td>
<td>ST810 Continuous Space &amp; Space-Time</td>
<td>Fuentes</td>
<td>4</td>
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<td></td>
<td>ST810 Spatial Epidemiology</td>
<td>Fuentes</td>
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<td></td>
<td>ST810 Statistics and Financial Risk</td>
<td>Bloomfield</td>
<td>20</td>
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<td></td>
<td>ST810 Semipar Methods &amp; Missing Data</td>
<td>Tsiatis</td>
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<tr>
<td>Spring 2009</td>
<td>ST790 Theory of Data Mining</td>
<td>Zhang, H.</td>
<td>9</td>
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<td>ST790 Model Selection</td>
<td>Boos</td>
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<tr>
<td></td>
<td>ST790 Bayesian Biostat</td>
<td>Ghosh</td>
<td>6</td>
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<tr>
<td></td>
<td>ST790 Adv Surviv Analy</td>
<td>Lu</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ST790 Quantile Regression</td>
<td>Wang</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ST810 Causal Inference</td>
<td>Tsiatis</td>
<td>12</td>
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<tr>
<td>Fall 2008</td>
<td>ST810 SAMSI Workshop</td>
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<td>ST810 SAMSI Workshop</td>
<td>Gremaud (SAMSI)</td>
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<td></td>
</tr>
</tbody>
</table>
CONSUELO ARELLANO  
Research Assistant Professor  
Campus Box 8203  
Dept. of Statistics  
North Carolina State University  
Raleigh, NC 27695-8203  
Phone: 919-515-1923  
Fax: 919-515-7591  
email: consuelo_arellano@ncsu.edu

Education

B.S. 1972 National Agrarian University, Lima, Peru. Statistics

Positions and Employment

1995-2000 Research Associate. Department of Statistics, North Carolina State University, Raleigh, NC.
March 2001 – August 2006. Non Tenured Associate Professor. National Agrarian University La Molina, Lima, Perú
August 2006 – May 2007. Visiting Assistant Professor. Texas A&M Kingsville, Department of Mathematics
June 2007 – Present. Research Assistant Professor, Department of Statistics, North Carolina State University.

Other Relevant Experiences and Professional Membership

American Statistical Association, ASA
Mu Sigma Rho, Honors Society for Statistics
Sigma Iota Rho, Honors Society for International Studies
Statisticians Without Borders (ASA)
Member of the Editorial Board of the peer-reviewed magazine Ecología Aplicada, published by the
Academic Department of Biology, Universidad Nacional Agraria La Molina.

Selected Peer Reviewed Publications (Last 5 years)


Cowger, Christina, and Consuelo Arellano. (2010), Plump kernels with high deoxynivalenol linked to late *Gibberella zeae* infection and marginal disease conditions in winter wheat. *Phytopathology*, **100**, 719-728.


**Courses Taught (Last 5 Years)**

ST 651/841 Statistical Consulting (NCSU).
ST 524 Statistics for Plant Science. (NCSU)
Multivariate Analysis (Texas A&M Kingsville)
Experimental Design and Applications,(Nat. Agrarian University, Lima, Perú)
Statistical Methods for Animal Science Research (Nat. Agrarian University, Lima, Perú)
Quantitative Ecology (Nat. Agrarian University, Lima, Perú)

**Master Students Supervised**
Advised 2 Master Students in last 3 years including current advisee.
Peter Bloomfield
Professor
Department of Statistics
Campus Box 8203
North Carolina State University
Raleigh, NC 27695-8203
Telephone: 919-515-1913
Fax: 919-515-1169
E-Mail: peter_bloomfield@ncsu.edu

Education
University of London  B.Sc.  1964–1967  Mathematics

Positions and Employment
1969–1970  Assistant Lecturer, Department of Mathematics, Imperial College, London
1970–1971  Lecturer, Department of Mathematics, Imperial College, London
1971–1975  Assistant Professor, Department of Statistics, Princeton University
1975–1979  Associate Professor, Department of Statistics, Princeton University
1979–1983  Professor and Chair, Department of Statistics, Princeton University
1983–Present  Professor, Department of Statistics, North Carolina State University

Other Relevant Experiences and Professional Memberships
1969  Fellow, Royal Statistical Society
1974  Member, Institute of Mathematical Statistics
1974  Member, American Statistical Association
1975–1979  Associate Editor, Technometrics
1982–1983  Visiting Professor, Department of Statistics, UNC Chapel Hill
1990 (Fall)  Visiting Fellow, Climatic Research Unit, University of East Anglia
1991 (Spring)  Visiting Senior Research Scientist, GFDL, Princeton University

Honors
1975  Fellow, Institute of Mathematical Statistics
1993  Fellow, American Statistical Association

Selected Peer-Reviewed Publications (Last 5 Years)


Research Support (Last 3 Years)
None

Courses Taught (Last 5 Years)

ST 430   Introduction to Regression Analysis  
ST 514   Statistics for Management and the Social Sciences II  
MA 547   Financial Mathematics  
ST 730   Applied Time Series Analysis  
ST 762   Nonlinear Statistical Models for Univariate and Multivariate Responses  
ST 516   Experimental Statistics for Engineers, II  
ST 810-004   Statistics and Financial Risk  
ST 498   Summer Practicum: Statistics and Financial Risk

Recent Graduate Training Experience (Last 5 Years)

Currently advise three M.Stat. students (Matt Austin, Josh Day, Ziran Gu)

Ph.D Students Supervised

Paramita Saha (2008), “Robust Inference with Quantile Regression in Stochastic Volatility Models with application to Value at Risk calculation” (Ph.D.)

Min Zhang (2008), “Joint Distributions of Time to Default with Application to the Pricing of Credit Derivatives” (Ph.D.)


Aric LaBarr (2010), “Multivariate Robust Estimation of DCC-GARCH Volatility Model” (Ph.D.)


Wanying Li (2011), “Application of Nonparametric Quantile Regression to Estimating Value at Risk” (Ph.D.)


Advised 6 Masters Students in last 3.5 years including current advisees
Education
B.A. 1998 Rutgers University Mathematics
M.S. 2002 Rutgers University Statistics
Ph.D. 2005 Rutgers University Statistics

Positions and Employment
2005-2011 Assistant Professor, Department of Statistics, NCSU
2011-Present Associate Professor, Department of Statistics, NCSU

Other Relevant Experiences and Professional Memberships
2008-Present Associate Editor for *Journal of the American Statistical Association*
2008-Present Associate Editor for *Biometrics*
2010-Present Associate Editor for *Biostatistics*

Honors
*Technometrics* Invited Paper presented at JSM 2009
Highlights of *JCGS* presentation at JSM 2013

Selected Peer-Reviewed Publications (Last 5 Years)


Research Support (Last 3 Years)

- NIH R01 MH84022, 2009-13 $1,111,615, “Genome-Wide Haplotype Association Analysis in Mental Disorders,” Co-Investigator.
- NSF DMS 1005612, 2010-13, $130,000, “Shrinkage Methods for Variable Selection and Structure Discovery, with Applications to High Dimensional Data,” PI.

Courses Taught (Last 5 Years)

- ST 370 Probability and Statistics for Engineers
- ST 512 Experimental Statistics II
- ST 514 Statistics For Management and Social Sciences II
- ST 522 Statistical Theory II
- ST 708 Applied Least Squares

Recent Graduate Training Experience (Last 5 Years)

Currently 5 Ph.D. students (Tian Chen, Anthony Franklin, Dehan Kong, Lixia Zhang, Na Zhang)

Ph.D Students Supervised


Advised 8 Masters Students in last 3.5 years including current advisees
DENNIS D. BOOS  
Professor & Associate Department Head  
Department of Statistics  
Campus Box 8203  
North Carolina State University  
Raleigh, NC 27695-8203  
Telephone: 919-515-1918  
Fax: 919-515-1169  
E-Mail: dennis_boos@ncsu.edu

Education  
B.S. 1970 Florida State University Physics  
M.S. 1975 Florida State University Statistics  
Ph.D. 1977 Florida State University Statistics

Positions and Employment  
1977-1982 Assistant Professor, Department of Statistics, NCSU  
1983-1989 Associate Professor, Department of Statistics, NCSU  
1989-2011 Professor, Department of Statistics, NCSU  
2011-Present Associate Department Head, Department of Statistics, NCSU

Other Relevant Experiences and Professional Memberships  
1982, Fall Sabbatical, Dept. of Statistics, Univ. of California, Berkeley.  
1985-1989 Associate Editor for Technometrics  
1986, Summer Visiting Professor, Limburgs Universitaire Centrum, Diepenbeek, Belgium  
1988-1990 Associate Editor for the Journal of the American Statistical Association  
1989, Fall Visiting Staff Fellow, Division of Biometry and Risk Assessment, National Institute of Environmental Health Sciences, RTP, NC  
2000-2004 Associate Editor for Biometrics  
2008-2011 Associate Editor for the Journal of the American Statistical Association

Honors  
Dave Mason Award (2005, service award given by NC State Dept. of Statistics)  
Fellow of the American Statistical Association (2001)

Selected Peer-Reviewed Publications (Last 5 Years)  


Research Support (Last 3 Years)

NIH Grant T15 HL 075859 2007-2010 $758,328, “Engaging the Next Generation of Biostatisticians.” Co-PI with Marie Davidian


Courses Taught (Last 5 Years)

ST 793 Advanced Statistical Inference I
ST 794 Advanced Statistical Inference II
ST 715 Theory Of Sampling Applied To Survey Design
ST 732 Applied Longitudinal Data Analysis
ST 401 Experiences in Data Analysis (SIBS)
ST 790 Special Topics - Model Selection

Recent Graduate Training Experience (Last 5 Years)

Currently supervise one Ph.D. student (A. Unfried)

Ph.D Students Supervised


Advised 12 Masters Students in last 3.5 years including current advisees
Education/Training
University of Virginia, BS, 1976-1980, Applied Mathematics
University of Virginia, MS, 1980-1981, Applied Mathematics
University of North Carolina at Chapel Hill (UNC-CH), PhD, 1982-1986, Statistics

Positions and Employment
Assistant Professor of Statistics, North Carolina State University (NCSU), 1987-1993
Associate Professor of Statistics, NCSU, 1993-1994, 1996-1998; Professor of Statistics, NCSU, 1998-
Associate Professor of Biostatistics, Harvard School of Public Health, 1994-1996
Adjunct Professor of Biostatistics and Bioinformatics, Duke University, 2001-
William Neal Reynolds Professor, Department of Statistics, NCSU, 2005-
Executive Committee, Center for Comparative Medicine and Translational Medicine Research, NCSU, 2006-2011
Director, Center for Quantitative Sciences in Biomedicine, NCSU, 2007-
Cluster Coordinator, Personalized Medicine Discovery Faculty Research Cluster, 2012-

Other Relevant Experiences and Professional Memberships (selected)
Member, American Statistical Association (ASA), Eastern North American Region (ENAR), International
Biometric Society (IBS), Institute of Mathematical Statistics (IMS), International Statistical Institute (ISI),
American Association for the Advancement of Science (AAAS), International Chinese Statistical Association,
International Indian Statistical Association, Tau Beta Pi, Sigma Xi
Editorial Advisory Board, Chemometrics and Intelligent Laboratory Systems, 1992-1999
Associate Editor, 1997-2000; Coordinating Editor, 2000-2002; Executive Editor, Biometrics, 2006-2014
NIH Biostatistical Methods and Research Design Study Section (formerly SNEM-5), 2000-2006, Chair 2004-2006
Leader, Program on Inverse Problem Methodology in Complex Stochastic Models, Statistical and Applied
Mathematical Sciences Institute (SAMSI), 2002-2003; Associate Editor, Statistica Sinica, 2003-2005
President, ENAR, International Biometric Society, 2004; Chair, IBS Editorial Advisory Committee, 2004-2007
Chair, Biometrics Section, ASA, 2005; ASA Committee on Nominations, 2006-2007 (Chair 2007)
Co-Leader, Summer Program on Dynamic Treatment Regimes and Multi-Stage Decision-Making, SAMSI, 2007
NIH AIDS Clinical Studies and Epidemiology Study Section, 2007-2011; President-Elect, President, ASA, 2012-2013

Honors (selected)
ASA Award for Outstanding Statistical Application 1993; Elected Ordinary Member, ISI, 1994; Fellow, ASA, 1998
George Challis Distinguished Lectureship in Biostatistics, University of Florida, 2002; Alumni Distinguished
Graduate Professor, NCSU, 2003; Myrto Lefkopoulou Distinguished Lectureship, Harvard School of Public Health,
2003; Alumni Outstanding Research Award, NCSU, 2005; Bernard Greenberg Distinguished Lecturer, UNC-CH,
2006; Fellow, IMS, 2006 Fellow, AAAS, 2006; Janet L. Norwood Award for Outstanding Achievement by a Woman
in the Statistical Sciences, 2007; George W. Snedecor Award, Committee of Presidents of Statistical Societies
(COPSS), 2009; IMS Medallion Lecturer, 2010; Alexander Quarles Holladay Medal for Excellence, NCSU, 2010
Florence Nightingale David Award, COPSS, 2011; President's Invited Address, ENAR Spring Meeting, 2012

Selected Peer-Reviewed Publications (Last 5 Years)
data. *Biometrics* 64, 567-576.


**Research Support (Last 3 Years)**
Principal Investigator (PI), NIH R01CA085848, Flexible Statistical Models for Biomedical Data, 2000-2015
PI (with M. Kosorok, S. George), NIH P01CA142538, Statistical Methods for Cancer Clinical Trials, 2010-2015
Co-Investigator (Co-I), NIH R37AI031789, Statistical Methods for AIDS Clinical Trials, 2008-2013
Co-I, NIH R01AI071915, Mathematical/Statistical Modeling to Inform Design of HIV Clinical Trials, 2006-2013
Co-I, NIH UL1 RR025747, UNC Clinical and Translational Science Award, 2008-2013

**Courses Taught (Last 5 Years)**
ST 762, Nonlinear Models for Univariate and Multivariate Response, Fall 2009
ST 810, Mathematical-Statistical Modeling and Analysis of Complex Systems, Fall 2009

**Recent Graduate Training Experience (Last 5 Years)**
Because of my ASA responsibilities in 2012-2013, I will be co-supervising one PhD student (T. Regh)
L. Tang, 2008, “Smooth” Inference for Clustered Survival Data, PhD
M. Zhang, 2008, Semiparametric Methods for Analysis of Randomized Clinical Trials and Arbitrarily Censored Time-to-event Data, PhD (with A. Tsiatis)
L. Elliott (Thomas), 2009, Adjustment for Measurement Error, PhD (with L. Stefanski)
W. Cao, 2009, Improving Efficiency and Robustness of Doubly Robust Estimators in the Presence of Censored Data, PhD (with A. Tsiatis)
P. Schulte, 2012, Q- and A-learning Methods for Estimating Optimal Treatment Regimes, PhD (with A. Tsiatis)
S. Yuan, 2012, Variable Selection and Inference for Covariate-Adjusted Semiparametric Inference in Randomized Clinical Trials, PhD (with H. Zhang)
B. Zhang, 2012, Robust Statistical Method for Estimating Optimal Dynamic Treatment Regimes, PhD (with A. Tsiatis)
D. Vock, 2012, Advanced Statistical Methods for Complex Longitudinal Data, PhD (with A. Tsiatis)

Advised 5 Masters Students in last 3.5 years including current advisees
David A. Dickey
Professor
Department of Statistics
Campus Box 8203
North Carolina State University
Raleigh, NC 27695-8203
Telephone: 919-515-1925
Fax: 919-515-1169
E-Mail: dickey@stat.ncsu.edu

Education
B.S. 1967 Miami University (Ohio) Mathematics
M.S. 1969 Miami University (Ohio) Mathematics
Ph.D. 1976 Iowa State University Statistics

Positions and Employment
1969-1971 Instructor, Department of Mathematics, College of William and Mary in Virginia
1971-1972 Instructor, Department of Mathematics, Randolph-Macon College
1976-present Professor, Department of Statistics, Professor, Institute for Advanced Analytics,
Professor, Financial Math program, Associate Faculty Status Economics (all at NCSU)

Other Relevant Experiences and Professional Memberships
10/2001: Visiting Scholar, Federal Reserve Bank of St Louis
09/1994 Elected to Academy of Outstanding Teachers, NCSU
Member of Honor Societies: Phi Kappa Phi, Sigma Xi, Mu Sigma Rho, Pi Mu Epsilon (mathematics),
Kappa Phi Kappa (education), Phi Mu Alpha(music)

Honors
Appointed William Neal Reynolds Professor, 2008
Fellow, American Statistical Association, August 2000
D.D. Mason Faculty Award, 1986.
Snedecor Award for outstanding statistics grad student, Iowa State, 1974

Selected Peer-Reviewed Publications (Last 5 Years)


**Research Support ( Last 3 Years)**
None (Institute for Advance Analytics reimbursed the department for ½ of my salary)

**Courses Taught (Last 5 Years)**
ST 711 Design of Experiments
ST 610G Applied Data Mining

**Recent Graduate Training Experience ( Last 5 Years)**
**Ph.D Students Supervised**
Melinda Thielbar (2010) Neural Networks for Time Series Forecasting: Practical Implications of Theoretical Results
Qianyi Zhang (2008) Seasonal Unit Root Tests – a Comparison

Advised 7 Masters Students in last 3.5 years including current advisees
MONTSE FUENTES
Professor & Department Head
Department of Statistics. NCSU

Education
B.S. 1993 University of Valladolid, Spain Mathematics. Music, Piano Performance
Ph.D. 1998 University of Chicago Statistics

Positions and Employment
1999-2003 Assistant Professor, Department of Statistics, NCSU
2003-2008 Associate Professor tenured, Department of Statistics, NCSU
2003-Present Associate status, Marine Earth Atmospheric Sciences, NCSU
2008-2011 Professor, Department of Statistics, NCSU
2011-Present Department Head, Department of Statistics, NCSU

Selected Relevant Experiences and Professional Memberships
2012-present Committee on Applied and Theoretical Statistics, National Academy of Sciences
2012-present Statistics Department Representative of ASA Academic Caucus
2011-present Chair-elect of the Computing and Graphics ASA section
12/2010-12/2013 Editor of the Journal of Agricultural, Biological, and Environmental Statistics
8/2011-present Faculty senator at NCSU
8/2010-present Senior Leader of the NSF ADVANCE program at NCSU
9/2009-present Member of the iSMOC committee of the National Children’s Study
3/2010-present Member of the EPA Science Advisory Board, TCE panel
1/2009-12/2011 Member of Committee on Federally Funded Research. ASA
6/2009-present Member of the ASA Climate Change Policy Advisory Committee
3/2007-Present National Academies. NRC Committee on Ozone Mortality Risk Reduction Benefits
4/2008-present Member of the scientific advisory committee of Health Canada
8/2007-9/2010 Member of IMS council
1/2004-9/2009 Member of US EPA Science Advisory Board’s Integrated Human Exposure Committee
1/2007-1/2008 Treasurer and secretary of the ASA Bayesian section
6/2005-6/2009 Member of the Biostatistical Methods and Research Design (BMRD) study section, NIH

Honors
Abdel El-Shaarawi Young Researcher’s Award (2003), recognition of outstanding contributions to environmetrics.
Fellow of the American Statistical Association (2008)

6 Selected Peer-Reviewed Publications (Last 5 Years)
Fuentes M, Reich BJ. Multivariate spatial nonparametric modeling via kernel processes mixing. Statistica Sinica, in press.


**Selected Research Support (Last 3 Years)**


NIH- R01. PI Fuentes (in collaboration with UNC-Biostatistics and Duke). Space-time Modeling for Linking Climate Change, Pollutant Exposure, Built Environments, and Health Outcomes. $1,094,446.


NASA. 2009-2011. PIs: Fred Bingham (Prof. of Oceanography, UNCW) and Fuentes. Statistical Validation of Sea Surface Salinity Measurements from Aquarius. Budget: $150,000 for 2 years.


**Courses Taught (Last 5 Years)**

- ST 522 Statistical Theory II
- ST 733 Applied Spatial Statistics
- ST 778 Measure Theory and Advanced Probability
- ST 790 Special Topics - Advance Spatial Statistics

**Recent Graduate Training Experience (Last 5 Years)**

Currently supervise seven Ph.D. students (Modlin, Lennon, Sucic, Lohem, Krut, Smith, and Cooney). Currently advising 3 postdocs (Guiness, Mannshardth, and Hammerling).

**Ph.D Students Supervised**

- Hon-Jung Kim, Ph.D. 2000.
- Jarrett Barber, Ph.D. 2002.
- Prashenn Agarwal, PhD. 2003.
- Li Chen,Ph.D. 2004.
- Man Sik Park, Ph. D. 2006.
- Hae-Ryoung Song, Ph.D. 2006.
- Kristen Madsen, Ph.D. 2006.
- Liyun Ma, Ph.D. 2006.
- Josh Warren, PhD 2011.

**Advised 5 M.S. students in last 3.5 years. PhD committee member for 22 NCSU students.**
SUJIT K. GHOSH
Professor & Co-Director of Graduate Programs
Department of Statistics, North Carolina State University
Telephone: 919-515-1950 and E-Mail: sujit.ghosh@ncsu.edu

Education
B.Stat. 1990 Indian Statistical Institute Statistics
Ph.D. 1996 University of Connecticut Statistics

Positions and Employment
1996-2002 Assistant Professor, Department of Statistics, NCSU
2002-2007 Associate Professor, Department of Statistics, NCSU
2007-Present Professor, Department of Statistics, NCSU
2010-Present Co-Director of Graduate Programs, Department of Statistics, NCSU

Other Relevant Experiences and Professional Memberships
1998 Elected member of Sigma Xi Honor Society.
1999 – 2001 Associate Editor of the ISBA Newsletter - Applications.
Jan – May 2003 Visiting Associate Professor at National University of Singapore.
May – Jun 2005, 2006 Visiting Associate Professor at Thammasat University, Thailand.
2007 – Present Associate Editor of Model Assisted Statistics and Applications
Dec 2007, 2009, 2011 Visiting Professor at Thammasat University, Thailand.
Jun – Jul 2008 MC-TOK Visiting Professor at Technical University of Crete, Greece.
2009 – Present Associate Editor of Journal of the Statistical Theory and Practice.
May 2009 Visiting Professor at Middle East Technical University, Ankara, Turkey.

Honors
Elected Vice President of the NC State Chapter of Sigma Xi Honor Society (2001 – 2003)
International Indian Statistical Association Young Investigator Award (2008)
Fellow of the American Statistical Association (2009)

Selected Peer-Reviewed Publications (Last 5 Years)


**Association, 105, 538-551.**


**Research Support (Last 3 Years)**

NSF Grant DMS-0703392, 2007-2013, $770,714, “CSUMS: NC State University Computation For Undergraduates in Statistics Program (CUSP),” (PI)


NSF Grant DUE-0806909, 2008-2013, $600,000, “Mentoring Students to Total Success,” Co-PI with R. Woodard.

NSF Grant DUE-0806909, 2008-2013, $600,000, “Mentoring Students to Total Success,” Co-PI with R. Woodard.


**Courses Taught (Last 5 Years)**

- ST 380  Probability and Statistics for Physical Sciences (Fall, 2009, 2010)
- ST 521  Statistical Theory - I (Fall, 2007)
- ST 522  Statistical Theory - II (Spring, 2010)
- ST 740  Introduction to Bayesian Inference (Fall, 2007)
- ST 790  Special Topics - Bayesian Biostatistics (Spring, 2009, 2010)
- ST 790  Special Topics - Advanced Bayesian Inference (Spring, 2012)
- ST 794  Advanced Statistical Inference-II (Spring 2007, 2008, 2009)

**Recent Graduate Training Experience (Last 5 Years)**

Currently supervise two Ph.D. students (Y. Li and L. Wang)

**Ph.D Students Supervised: 16**

2012: Jeeraporn Thaithanan* and Piyada Thongjaem*
2011: Jiangdian Wang and Muhtar Osman
2010: Ani Eloyan and Autcha Araveeporn*
2009: Ying Zhu*, Kaushal, Mishra*, Carl Dicasoli*, Elizabeth Krachey* and Haojun Ouyang*
2008: Arun Krishna*, Suraj Anand, S. McKay Curtis* and Emily H. Griffith*
2007: Shufang Liu
*Co-adisor

**Masters Students Advised: 7** (in last 3.5 years including current advisees)
**SUBHASHIS GHOSHAL**
Professor, Department of Statistics
North Carolina State University
Raleigh, NC 27695, Campus Box-8203
E-mail: ghoshal@stat.ncsu.edu
Fax: 1-919-515-1169, Phone: 1-919-513-0190
Web: http://www4.stat.ncsu.edu/~ghoshal

**Education**
- Ph.D. (Statistics), 1995, Indian Statistical Institute, Calcutta, India.
- M. S. (Statistics), 1990, Indian Statistical Institute, Calcutta, India.
- B. S. (Statistics), 1988, Indian Statistical Institute, Calcutta, India.

**Positions and Employment**
- 2008–Present: Professor, Department of Statistics, NCSU.
- 2004–2008: Associate Professor, Department of Statistics, NCSU.
- 2001–2004: Assistant Professor, Department of Statistics, NCSU.

**Honors (Last 10 Years)**
- IISA Young Researcher Award, 2006–2007.
- Sigma Xi research award, 2004.

**Editorial Activities (Last 5 Years)**

**Other Services to Profession (Last 5 Years)**
- Chair, scientific committee, 9th Bayesian Nonparametrics Workshop, 2013.
- Program committee, 8th Nonparametric Bayesian workshop, 2011.
- Chair, scientific committee, SRCOS Summer Research Conference, 2010.
- Program committee, 7th Nonparametric Bayesian workshop, 2009.
- IISA Young Researcher Award Committee, 2008.

**Selected Peer-Reviewed Publications (Last 5 years)**


**Research Support (Last 3 Years)**
- NSA grant 101015, 2012–2014, $117,070, PI.
- NSF grant 1106570, 2011–2014, $250,000, PI.
- NSF grant 0803540, 2018–2011, $59,999, PI.
- NSF grant 0349111, 2004–2010, $400,000, PI.
- NSF grant 1105469, 2011–2012, $20,000, PI.
- NSA grant 1105469, 2011–2012, $14,950, PI.

**Courses Taught (Last 5 Years)**
- ST 790: Asymptotic Statistics (3 times);
- ST 779: Measure theory and advanced probability (3 times);
- ST 778: Measure theory and advanced probability I (2 times);
- ST 779: Measure theory and advanced probability II (3 times);
- ST 746: Stochastic Processes (3 times);

**Recent Graduate Training Experience**
- Currently supervising four Ph. D. students (Adam Suarez, Weining Shen, Sayantan Banerjee, Meng Li).

**Doctoral Student Advising (Last 5 Years)**
- Jiezhun Gu (2007), “Nonparametric and semiparametric inference about ROC curve”.
- Yuefeng Wu (2009), “Asymptotic behavior of some Bayesian nonparametric and semiparametric procedure”.
- John T. White (2010), “Bayesian multiscale smoothing of photon-limited images with applications to astronomy and medicine”.

**Advised 12 Masters Students in last 3.5 years including current advisees**
Emily Hohmeister Griffith  
Survey Statistician  
Federal Bureau of Investigation  
958 Ashton Place  
Morgantown, WV 26508  
304.694.5814  
emilyhgriff@gmail.com

Education/Training

Florida State University, Bachelor of Science, 2000-03, Statistics, minors in Spanish and mathematics


North Carolina State University, Ph.D., 2005-08, Statistics.

Positions and Employment

Aug 2003 – May 2004  Graduate Teaching Assistant North Carolina State University, Department of Statistics  
ST 350: Economics and Business Statistics (Fall 2003)  
ST 507: Statistics for the Behavioral Sciences I (Spring 2004)

June 2004 – Aug 2004  Project Coordinator Research Engineering Apprenticeship Program (REAP)  
REAP Grant, North Carolina State University, Department of Statistics

Aug 2004 – May 2005  Instructor North Carolina State University, Department of Statistics  
ST 311: Introduction to Statistics (sole instructor over two semesters)


Aug 2005 – Dec 2005  Graduate Teaching Assistant North Carolina State University, Department of Statistics  
ST 715: Theory of Sampling Applied to Survey Design

Jan 2005 – Dec 2006  National Science Foundation Vertical Integration of Research and Education (VIGRE) Fellowship Recipient North Carolina State University, Department of Statistics


Sept 2006 – April 2007  Statistics Instructor Contract with the Center for Coastal Habitat and Fisheries Research, Beaufort NC

Jan 2007 – Dec 2007  Consulting Research Assistant North Carolina State University, College of Agriculture and Life Sciences (CALS)

Jan 2008 – March 2008  National Science Foundation Vertical Integration of Research and Education (VIGRE) Fellowship Recipient North Carolina State University, Department of Statistics

April 2008 – June 2009  Postdoctoral Research Associate Patuxent Wildlife Research Center United States Geological Survey
June 2009 – Present  Survey Statistician Crime Analysis, Research and Development Unit Federal Bureau of Investigation

Other Relevant Experiences and Professional Memberships

- American Statistical Association (ASA) member
- North Carolina State University Statistics and Biomath Graduate Student Association, Vice-President (2004-2005), President (2005-2006)

Honors

- Recipient of Florida Bright Futures Scholarship (2000-2003) and additional merit scholarship
- Phi Beta Kappa National Honor Society (elected 2003)
- United States Conference on Teaching Statistics (USCOTS) (attendance funded by the Department of Statistics, North Carolina State University, 2005)
- Nineteenth Annual Graduate Student Professional Development Workshop (selected to attend by Statistics Graduate Program Director, North Carolina State University)
- Francis G. Giesbrecht Award for Statistical Consulting recipient (2008)
- Recipient of Time Off Award in Recognition of Superior Service to the FBI (2011)
- Earned On-the-Spot Awards twice for acts of service at the FBI (2011)

Selected Peer-Reviewed Publications


I will start at North Carolina State University as a Research Assistant Professor in the Statistics Department in January of 2013.
KEVIN GROSS
Associate Professor
Department of Statistics
CB 8203
NCSU
Raleigh, NC 27695
Tel.: 1-919-513-4690
email: kevin_gross@ncsu.edu

Education

B.S.  1996  Duke University  Biology
M.S.  2000  Univ. of Wisconsin-Madison  Statistics
Ph.D.  2003  Univ. of Wisconsin-Madison  Zoology and Statistics

Positions and Employment

2003-2009  Assistant professor, Department of Statistics, NCSU
2009-present  Associate professor, Department of Statistics, NCSU

Other Relevant Experience and Professional Service

2007-present  Associate editor for Ecology Letters
2007, 2010-2012  NSF panel service
2009-2011  Chair / vice-chair, Theoretical Ecology section of the
Ecological Society of America
2011-present  Associate editor for Theoretical Ecology

Selected Peer-Reviewed Publications (Last 5 years)

and their monetary cost with causal inference statistics. Ecological Applications 21:
2770-2780.
Separating the influence of resource ‘availability’ from resource ‘imbalance’ on
productivity or vice versa? A test of the multivariate productivity-diversity
Gross, K. 2008. Positive interactions among competitors can produce species-rich


**Research Support (Last 3 Years)**


Collaborative research: The community ecology of viral pathogens - Causes and consequences of coinfection in hosts and vectors. NSF collaborative proposal with C. E. Mitchell and 4 others. Funded 7/1/10 - 6/30/15. $358,631 (KG portion).

**Courses Taught (Last 5 Years)**

- ST 380  Probability and Statistics for the Physical Sciences
- ST 512  Experimental Statistics for the Biological Sciences II, with lab
- BMA 772  Biomathematics II
- BMA 567  Modeling of Biological Systems, with lab

**Past and current Ph.D. Students Supervised (Last 5 Years).**


**Past and current thesis MS students Supervised (Last 5 Years).**

Andrew Snyder-Beattie. Current BMA MS (thesis) student.

**Advised 2 additional non-thesis MS students in past 3.5 years.**
Joseph Guinness
Postdoctoral Research Scholar
Department of Statistics
Box 8203
North Carolina State University
Raleigh, NC 27695-8203
Telephone: (919) 513-0191
Fax: (919) 515-7591
jsguinne@ncsu.edu

Education/Training
Washington University in St. Louis, A.B., 2003-2007, Mathematics and Physics
University of Chicago, Ph.D., 2007-2012, Statistics

Positions and Employment
Postdoctoral Research Scholar, NC State University, Department of Statistics, 2012-present

Other Relevant Experiences and Professional Memberships
Member, American Statistical Association
Member, Institute of Mathematical Statistics

Selected Peer-Reviewed Publications

JACQUELINE M. HUGHES-OLIVER  
Professor  
Department of Statistics  
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Raleigh, NC 27695-8203  
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Fax: 919-515-1169  
E-Mail: hughesol@ncsu.edu  

Education  
B.A. 1986 University of Cincinnati Mathematics  
Ph.D. 1991 North Carolina State University Statistics  

Positions and Employment  
1991-1992 Visiting Assistant Professor, Department of Statistics, University of Wisconsin at Madison  
1992-1999 Assistant Professor, Department of Statistics, NCSU  
1999-2006 Associate Professor, Department of Statistics, NCSU  
2006-Present Professor, Department of Statistics, NCSU  
2007-2010 Co-Director of Graduate Programs, Department of Statistics, NCSU  
2011-Present On professional leave, George Mason University  

Other Relevant Experiences and Professional Memberships  
2003-2004 SAMSI Faculty Fellow, Data-Mining and Machine Learning  
2004-2006 Associate Editor, JASA – Applications and Case Studies  
2006-2009 Editorial Board of Chemometrics and Intelligent Laboratory Systems  
2009-2011 American Statistical Association Committee on Fellows  
2009-2012 NIH Biostatistical Methods and Research Design (BMRD) Study Section  

Honors  
• Outstanding Service Award for Extension, Engagement, and Economic Development, NCSU, 2010  
• University Diversity Award to a Faculty Member, NCSU 2010  
• Fellow of the American Statistical Association, 2007  
• Statistics in Chemistry Award, ASA, 2006  
• D. D. Mason Faculty Award (service award given by NCSU Dept. of Statistics), 2006  
• College of Physical & Mathematical Sciences Board of Governor’s Award for Excellence in Teaching, NCSU, 2004  
• Alumni Distinguished Undergraduate Professor, NCSU, 2003  

Selected Peer-Reviewed Publications (Last 5 Years)  


**Research Support (Last 3 Years)**

• NIH Grant R01 OH003669, 2010-2013, $726,580. Influence of Metal-Working Fluid Formulations on Dermal Absorption of Biocides. Co-Investigator with PI R. Baynes (Veterinary Medicine)

• NSF Grant DUE-0806909, 2008-2013, $600,000. Mentoring Students to Total Success. Co-PI with Pamela Arroway until 2011.

• NIH Grant P20 HG003900, 2005-2009, $1,111,110. Comparative and Web-Enabled Virtual Screening. PI.

**Courses Taught (Last 5 Years)**

ST 435 Statistical Methods for Quality and Productivity Improvement (with ST 535)

ST 521 Statistical Theory I

ST 522 Statistical Theory II

ST 535 Statistical Process Control (with ST 435)

ST 708 Applied Least Squares

**Recent Graduate Training Experience (Last 5 Years)**

PhD. Students Supervised:

• Jiajun Liu (August 2007), Domain Enhanced Analysis of Microarray Data Using GO Annotations, (with Jason Osborne)

• Amy Nail (December 2007), Quantifying local creation and regional transport using a hierarchical space-time model of ozone as a function of observed NOx, a latent space-time VOC process, emissions, and meteorology, (with John Monahan)

• Atina Brooks, ABD

**Advised 5 Masters Students in last 3.5 years including current advisees**
Curriculum Vitae

William F. Hunt, Jr.
Adjunct Professor
Department of Statistics
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919-515-1947
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whunt@stat.ncsu.edu

EDUCATION

M.S.; January 1968; Department of Statistics, Rutgers University, New Brunswick, NJ
B.A.; June 1966; Mathematics; Rutgers University, Newark, NJ
Advanced Institute on Stat. Ecology; summer 1972; Pennsylvania State University, State College, PA
Air Pollution Control Engineering; spring 1978; California Institute of Technology, Pasadena, CA

POSITIONS HELD


1/1968 - 2/1970: Commissioned Officer, Mathematical Statistician, Division of Health Effects Research, National Air Pollution Control Administration, U.S. Public Health Service, Durham, NC.


8/1984 – 9/1984: Consultant III, OECD, Paris, France

11/1972 - 10/1987: Chief, Data Analysis Section, Monitoring and Reports Branch, Monitoring and Data Analysis Division, USEPA, Research Triangle Park, NC


5/1994 - 2/1999: Director, Emissions, Monitoring and Data Analysis Division, USEPA, RTP, NC.

3/1999 - Present: Adjunct Professor, Department of Statistics, North Carolina State University

HONORS AND AWARDS

Phi Beta Kappa, 1966
Sigma XI, 1968
Honorary Louisiana Colonel, 1979
ASQC Award for Outstanding Service, 1985
USEPA Gold Medal for Exceptional Service for Persian Gulf Service, 1992
ASA, Distinguished Achievement Award, Section on Statistics and the Environment, 1993
Elected Member of the International Statistical Institute, 1995
Air and Waste Management Association, Fellow Member, 1995
20th Century Distinguished Service Award for Work in Environmental Statistics and Ecological
Statistics, Ninth Lukacs Symposium, 1999
Who’s Who Among America’s Teachers, 2005
Outstanding Service Extension Award, NCSU, 2007
American Statistical Association, Fellow Member, 2009

Selected Peer-Reviewed Publications

W. Hunt, D. Mintz, Rachael Marceau, Alissa Anderson, Kristen Immen, Ryland Pigg, “Air Quality

W. Hunt, “Facilitating Communication on Air Pollution and Health with the Air Quality Index,”
Encyclopedia of Environmetrics, 2012

G. Pouliot, Emily Wisner, D. Mobley and W. Hunt, “Quantification of emission factor uncertainty,”

W. Hunt, (2009), Ten Students Applied for NCSU Undergraduate Research Awards and Won! AmStat


M. Oliver-Hoyo, Allen, W. Hunt, J. Hutson and Angela Pitts, “Effects of an Active Learning
Environment: Teaching Innovations at a Research I Institution,” Journal of Chemical

W. Hunt, “Book Review, Global Environment Change. Issues in Environmental Science and

D. Leaf and H. Verlome and W. Hunt, “Summary of Regulatory/Policy/Economic Issues Related

W. Hunt, “Introduction to the regulatory/public/economics section,” Environmental

W. Hunt, “A Win-Win-Win Partnership for Training Environmental Statisticians,” AmStat

W. Hunt, “Pollutant Standards Index,” Encyclopedia of Environmetrics (SBN 0471 899976),
published by John Wiley & Sons, Ltd., Chichester, United Kingdom, 2002.

Courses Taught (Last 5 Years)

Stat 495 Environmental Statistics Practicum
Stat 498 Special Topics in Environmental Statistics
Stat 361 Introduction to Statistics for Engineers
Curriculum Vitae: Snehalata V. Huzurbazar

Research Associate Prof  
Statistics  
Box 8203  
North Carolina State University  
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919-685-9380  
919-685-9360 (fax)  
svhuzurb@ncsu.edu

Deputy Director  
Statistical and Applied Mathematical Sciences Institute (SAMSI)  
P.O. Box 14006  
SAMSI  
19 TW Alexander Drive; Research Triangle Park, NC  
27709-4006  
919-685-9380  
919-685-9360 (fax)  
huzurbazar@samsi.info

Education and Training  
Grinnell College  
BA 1980-1984 Independent Major(Political Science,History,Sociology,Spanish)

Vanderbilt University  
MA 1984-1988 Economics

Colorado State University  
PhD 1987-1992 Statistics

Positions and Employment

1992–1995 Assistant Professor, Department of Statistics, University of Georgia, Athens, GA.

1995–2001 Assistant Professor, Department of Statistics, University of Wyoming, Laramie, WY.

2001–present Associate Professor, Department of Statistics, University of Wyoming, Laramie, WY.

2003–2008 Adjunct Associate Professor, Women’s Studies Program, 2003-present, Affiliate, Science and Mathematics Teaching Center, University of Wyoming, Laramie, WY.

2004–2005 Visiting Scientist, Institute of Arctic and Alpine Research, University of Colorado, Boulder, CO.

2011(Jan–April) Visiting Faculty, Statistics and Applied Mathematical Sciences Institute, RTP, NC.

2012 (July – present) Deputy Director of SAMSI and Research Associate Professor, Statistics, NCSU.

Other Relevant Experiences and Professional Memberships


Honors

Extraordinary Merit in Research Award (1999-2000), College of Arts and Sciences, University of Wyoming.

Selected Peer-Reviewed Publications (Last 5 Years)


Research Support


2009 - 2013 “Statistical Modelling for Gene Duplication”, Wyoming Bioinformatics Core supported by IDeA Networks of Biomedical Research Excellence (NCCR), 1 fully funded 4-year Graduate Assistant position.

2012-2015 “Quantitative characterization of rapid changes in alluvial stacking pattern and impact on reservoir continuity: Morrison Formation (Upper Jurassic) and Wasatch Formation (Paleogene), western Colorado and east central Utah”, Paul Heller (PI), Chevron, $87,000.

2011-2012 "Enhanced Oil Recovery Data Base Screening and Modelling of Compositional Data", Vladimir Alvarado (PI), University of Wyoming Enhanced Oil Recovery Institute. $120,000.


Courses Taught


Recent Graduate Training Experience


Past students over last 5 years: 2 Ph.D. Students:
Arunendu Chatterjee (2009), Dissertation Title: “Detection of Change Points using Wavelet Analysis”, Ph.D.
Xinge Jessie Jeng  
Assistant Professor  
Department of Statistics  
Campus Box 8203  
North Carolina State University  
Raleigh, NC 27695-8203  
Telephone: 919-515-0612  
Fax: 919-515-1169  
E-Mail: xjjeng@ncsu.edu

Education

B.A. 2001 Fudan University Accounting  
M.A. 2002 Columbia University Mathematics of Finance  
M.S. 2004 University of Chicago Statistics  
Ph.D. 2009 Purdue University Statistics

Positions and Employment

2009-2012  Postdoctoral Fellow, Department of Biostatistics & Epidemiology, UPenn  
2012-Present  Assistant Professor, Department of Statistics, NCSU

Honors

David P. Byar Young Investigator Award (2010, Biometrics Section, ASA)  
Purdue Research Foundation Fellowship (2007, Purdue University)

Selected Peer-Reviewed Publications (Last 5 Years)


X. Jessie Jeng, Tony Cai, and Hongzhe Li (2012). Simultaneous Discovery of Rare and Common Segment Variants. Biometrika. Accepted.

Courses Taught (Last 5 Years)

ST 511  Experimental Statistics for Biological Sciences I

Supervised 0 Graduate Students
Eric B. Laber  
Assistant Professor  
Department of Statistics, Campus Box 8203  
North Carolina State University  
Raleigh, NC 27695-8203  
Telephone: 919-515-7675  
Fax: 919-515-1169  
E-Mail: laber@stat.ncsu.edu

EDUCATION

B.S.  2005 University of California at Los Angeles  Mathematics and Computing
M.A.  2007 University of Michigan  Statistics
Ph.D.  2011 University of Michigan  Statistics

Positions and Employment

2011-Present  Assistant Professor  NCSU
2008-2011  Research Assistant  ISR University of Michigan
2008-2010  Editors Assistant  Journal of Sociological Methodology
2008  Research Assistant  IOE University of Michigan
2007  Intern  Google Inc.

Other Relevant Experiences and Professional Memberships

2012-2013  SAMSI Faculty fellow program on data-driven decisions in healthcare
2012  Chair young researchers advisory committee STAT journal of statistics
2012  Guest editor Communications in Statistics: Simulation and Computation, special issue on the joint meeting of y-BIS and jSPE
2012  Organizing committee joint meeting of ASA Section of Statistical Learning and Data Mining and ISBIS, Durham, NC, 2014

Honors

2011  JASA Theory and Methods invited paper  JSM
2010  Rackham Predoctoral Fellowship  University of Michigan
2010  Highlighted student talk  MSSISS
2009  Junior Oberwolfach Fellow  Oberwolfach Germany
2009  Trainee Poster Award, 3rd Place  20th Annual Albert J. Silverman
2009  Best poster, Second Midwest Statistics Research Colloquium  Chicago, IL
2007  Quantitative Methodology Program Fellowship  University of Michigan
2007  Outstanding First Year Ph.D. Student  University of Michigan
2006  JB Duke Fellowship  Duke University
2005  Sherwood Award in Mathematics  UCLA
Selected Peer-Reviewed Publications (Last 4 Years)


Research Support (Last Year)

NCSU mini-grant, external mentoring grant, 2012, $1,250

NIH 1 Grant P01 CA142538-01, 2010-2015 $2,444,504, “Statistical Methods for Cancer Clinical Trials.”

Courses Taught (Last Year)

ST 745  Applied Survival Analysis
ST 370  Statistics for Engineers

Recent Graduate Training Experience (Last 1 Years)

Currently supervise three Ph.D. students (Kristin Linn, Kasturi Talapatra, Na Zhang)

Advised 2 Masters Students in last 1.5 years including current advisees
Soumendra Nath Lahiri
Professor, Department of Statistics,
North Carolina State University
Raleigh, NC 27695-8203
Telephone: 919-515-1906
Fax: 919-515-1169
E-Mail: snlahiri@ncsu.edu

EDUCATION:
1986-1989: Ph.D. in Statistics, Michigan State University, USA.
1984-1986: M.STAT., Indian Statistical Institute, Calcutta, India.

POSITIONS HELD:
2012 - present: Professor, Dept. of Statistics, NCSU
2006 - present: Professor, Dept. of Statistics, Texas A&M Univ. (currently on leave).
1994 - 1998: Associate Professor, Dept. of Statistics, ISU.
1989 - 1994: Assistant Professor, Dept. of Statistics, ISU.

Other Professional Experiences:
1998-1999: President, Iowa Chapter, American Statistical Association
1999-2000: Secretary, Section on Nonparametric Statistics, American Statistical Association
2006-2007: Program chair, Section on Nonparametric Statistics, American Statistical Association
2007-2011: Editor, Sankhya, Series A.
2010-2012: Associate Editor, Annals of Statistics.
2010-2013: Executive committee member, International Society for Nonparametric Statistics.

HONORS AND DISTINCTIONS:
* Received the 1994 ISU Foundation Award for Early Achievement in Research and Scholarship.
* Fellow, Institute of Mathematical Statistics, 2001
* American Statistical Association, 2002
* Elected member, International Statistical Institute, 2005

Selected RESEARCH PAPERS (last 5 years).


**RESEARCH SUPPORT (Last 3 Years)**
1. NSF research grant 2010-2013 (DMS-PI)
2. NSA research grant 2010-2012 (PI)
3. NSF research grant 2007-2010 (DMS-PI)
4. NSF research grant 2003-2007. (DMS-PI)

**COURSES TAUGHT (at NCSU)**

ST515 Probability and Statistics for Engineers

ST 730 Applied Time series

**D. LIST OF ADVISEES (LAST 5 YEARS).**

Krista Rister, Ph.D., Fall 2010

(Mathematical Statistician, Capital One).


(Assistant Professor, Dept of Math, Lehigh Univ.).

Arindam Chatterjee, Summer, 2007

(Assistant Professor, Stat-Math division, Indian Statistical Institute, Delhi)
LEXIN LI  
Associate Professor  
Department of Statistics  
Campus Box 8203  
North Carolina State University  
Raleigh, NC 27695-8203  
Telephone: 919-515-1929  
Fax: 919-515-1169  
E-Mail: lexin_li@ncsu.edu

Education  
B.S. 1998 Zhejiang University Electrical Engineering  
M.S. 2002 University of Minnesota, Twin cities Statistics  
Ph.D. 2003 University of Minnesota, Twin cities Statistics

Positions and Employment  
2005-2011 Assistant Professor, Department of Statistics, NCSU  
2011-present Associate Professor, Department of Statistics, NCSU

Other Relevant Experiences and Professional Memberships  
2011-2013 Visiting Professor, Department of Statistics, Stanford University  
2013- Associate Editor for Technometrics

Selected Peer-Reviewed Publications (Last 5 Years)  


**Research Support (Last 3 Years)**


Research Grants Council of Hong Kong Grant HKBU2034/09P, 2010-2011, HKD$416,000, “On inference and variable selection for semiparametric models with high dimensional predictors,” co-PI with Lixing Zhu

NSF Grant DMS-1106668, 2011-2014, $100,000, “New dimension reduction approaches for modern scientific data with high dimensionality and complex structure,” PI

**Courses Taught (Last 5 Years)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST 790</td>
<td>Advanced topic: introduction to dimension reduction</td>
</tr>
<tr>
<td>ST 761</td>
<td>Nonlinear models</td>
</tr>
<tr>
<td>ST 731</td>
<td>Applied multivariate analysis</td>
</tr>
<tr>
<td>ST 372</td>
<td>Introduction to statistical inference and regression</td>
</tr>
<tr>
<td>ST 371</td>
<td>Introduction to probability and distribution theory</td>
</tr>
</tbody>
</table>

**Recent Graduate Training Experience (Last 5 Years)**

Currently supervise 3 Ph.D. students (A. Franklin, X. Li, B. Zhang,)

**Ph.D Students Supervised**


**Advised 10 Masters Students in last 3.5 years including current advisees**
Wenbin Lu  
Associate Professor  
Department of Statistics  
Campus Box 8203  
North Carolina State University  
Raleigh, NC 27695-8203  
Telephone: 919-515-1915  
Fax: 919-515-1169  
E-Mail: lu@stat.ncsu.edu

Education  
B.S.  1999 Beijing University Statistics  
M.S.  2000 Columbia University Statistics  
Ph.D.  2003 Columbia University Statistics

Positions and Employment  
2003-2009  Assistant Professor, Department of Statistics, NCSU  
2009-present  Associate Professor, Department of Statistics, NCSU

Other Relevant Experiences and Professional Memberships  
2007-2008  Faculty Fellow, SAMSI, Research Triangle Park, NC  
2011-2012  Sabbatical, Dept. of Biostatistics, UNC, Chapel Hill  
2010-present  Associate Editor for Biostatistics  
2010-present  Associate Editor for Journal of Statistical Theory and Practice  
2012-present  Associate Editor for Biometrics

Honors  
Faculty Research and Professional Development Award (2004, NCSU)  
CFAR Development Award (2012, UNC Center for AIDS Research)

Selected Peer-Reviewed Publications (Last 5 years)  
  *Statistica Sinica*, 20, 661-674.  

**Research Support (Last 3 Years)**
NIH Grant R01 CA14063 2010-2014 $825,172, "Flexible Statistical Methods for Complex Survival Data in Biomedical Studies." (PI)
NIH Grant R03 CA150077 2010-2012 $157,990, "Sample Size Method and Software Development in Survival Trial with a Cure Rate." (co-inv, PI: Jiajia Zhang)
NIH Grant R03 CA153083 2010-2012 $178,723, "Time-Variant Effects of Cancer Risk Factors in Nested Case-Control Studies." (co-inv, PI: Mengling Liu)
NIH Grant R01 CA051962 2010-2012 "Statistical Analysis of Complex Data in Cancer." (co-inv, PI: Anastasios Tsiatis)

**Courses Taught (Last 5 Years)**
ST 521 Statistical Inference I
ST 745 Analysis of Survival Data
ST 732 Applied Longitudinal Data Analysis
ST 790 Special Topics - Advanced Survival Analysis

**Recent Graduate Training Experience (Last 5 Years)**

**Current Ph.D Students**
Yuan Geng (with Hao Helen Zhang)
Wei Xiao (with Hao Helen Zhang)

**Ph.D Students Supervised**
Miao Yu (2007), "Quantitative Trait Loci (QTL) Mapping With Longitudinal Traits" (with Daowen Zhang)
Justin Shows (2009), "Sparse Estimation and Inference for Censored Median Regression" (with Hao Helen Zhang)
Elizabeth Krachey (2009), "Variations on the Accelerated Failure Time Model: Mixture Distributions, Cure Rates, and Different Censoring Scenarios" (with Sujit Ghosh)
Ahn Mihye (2010), "Random Effect Selection in Linear Mixed Models" (with Hao Helen Zhang)
Na Cai (2011), "Semiparametric Regression Methods for Longitudinal Data with Informative Observation Times and/or Dropout" (with Hao Helen Zhang)
Chuan Tian, Ph.D. co-major in Statistics (2011), "Statistical Methods on Drug Discovery" (with Lexin Li)
Song Yan (2011), "Joint Modeling of Primary Binary Outcome and Longitudinal Covariates Measured at Informative Observation Times" (with Daowen Zhang)
Zifang Guo (2011), "Variable Selection and Dimension Reduction for High Dimensional Complex Data" (with Dr. Lexin Li)
Lei Pang (2011), "Semiparametric Estimation and Inference for Censored Regression Models" (with Huixia Judy Wang)
Bo Liu (2012), "Accelerated Failure Time Model for Correlated Survival Data: Efficient Estimation and Inference"

Advised 8 Masters Students in last 3.5 years including current advisees
ARNAB MAITY  
Assistant Professor  
Department of Statistics  
North Carolina State University, Raleigh, NC 27695-8203  
Telephone: 919-515-1937  
E-Mail: amaity@ncsu.edu

Education  
B.Stat.  2003 Indian Statistical Institute Statistics  
M.S.  2005 Texas A&M University Statistics  
Ph.D.  2008 Texas A&M University Statistics

Positions and Employment  
2010-present  Assistant Professor, Department of Statistics, NCSU  
2008-2010  Postdoctoral Fellow, Department of Biostatistics, Harvard School of Public Health

Other Relevant Experiences and Professional Memberships  
2012-present  Associate Editor for *Sankhya - The Indian Journal of Statistics, Series A*  
2012-present  Associate Editor for *Sankhya - The Indian Journal of Statistics, Series B*

Honors  
NSF Young Researcher Award, AISC Conference, Greensboro, NC, 2012.  
Innovative Biomedical Application Award, SRCOS SRC Conference, 2008.  
R. L. Anderson Student Paper Award, SRCOS SRC Conference, 2008.  
ASA Travel Award, SRCOS SRC Conference, Charleston, SC, 2008.  
Best Student Paper Award (Theory Section), IISA Conference, 2008.  
NSF Travel Grant, Nonparametric Conference, South Carolina, 2007.  
Distinguished Student Paper Award, ENAR, 2006.

Selected Peer-Reviewed Publications (Last 5 Years)  


Research Support (Last 3 Years)

NC State Faculty Research and Professional Development (FRPD) grant, 2012-2013, $2,000, “Statistical Tools for Analyzing Functional Data in Genomic Studies.”

NIEHS grant R00ES017744 (K99/R00 Pathway to independence award), 2010-2013, $733,885, “Statistical Methods for Analysis of High-Dimensional Gene and Environment Data.”

Harvard NIEHS Center for Environmental Health Pilot Grant, 2009-2010, $15,000, “Statistical Methods for Analysis of High-Dimensional Epigenetic and Environmental Data.”

Courses Taught (Last 5 Years)

ST 810 Functional Data Analysis (Advanced Topics in Statistics), Fall 2012
ST 731 Applied Multivariate Statistical Analysis, Spring 2012

Recent Graduate Training Experience (Last 5 Years)

Currently supervise four Ph.D. students (J. Usset, C. A. Davenport, J. Zhao, A. Coles)

Advised 5 Masters Students in last 2 years.
ELIZABETH MANNSHARDT
POSTDOCTORAL RESEARCH SCHOLAR
DEPARTMENT OF STATISTICS
BOX # 8203
North Carolina State University
Raleigh, NC 27695-8203
TELEPHONE # 919-513-2445
FAX # 515-7591
ecmannsh@ncsu.edu

Education/Training

B.S., Mathematics – Sonoma State University, 1995-2000
M.S., Statistics – University of North Carolina at Chapel Hill, 2001-2005
Ph.D., Statistics – University of North Carolina at Chapel Hill, 2005-2008

Positions and Employment

Project Analyst – Fair, Isaac’s & Co. 2000-2001
Instructor – Statistics Department, UNC Chapel Hill, 2001-2004
Visiting Researcher – National Center for Atmospheric Research, 2006
Research Fellow – National Oceanic & Atmospheric Administration, 2006-2008
Postdoctoral Fellow – Statistical and Applied Mathematical Sciences Institute, 2008-2010
Visiting Assistant Professor – Duke University, 2008-2011
Assistant Director, The Program in Spatial Statistics and Environmental Statistics – The Ohio State University, 2011-2012
Postdoctoral Research Scholar, STATMOS – Department of Statistics, North Carolina State University, March 2012-present

Professional Memberships

American Statistical Association (ASA), 2001-present
The International Environmetrics Society, 2007-2010
International Society for Bayesian Analysis, 2008-2010
ASA Section on Statistics and the Environment (ENVR), 2012
American Geophysical Union, 2012

Honors

Graduate Student Teacher of the Year - Department of Statistics, UNC Chapel Hill, 2004
Young Researcher’s Award – Winter Workshop: Environmental & Environmental Health Statistics, University of Florida Gainesville, 2007
Invited Speaker – 8th International Purdue Symposium on Statistics, 2012
Invited Speaker – ENVR Workshop on Environmetrics, 2012

Selected Peer-Reviewed Publications (Last 5 Years)


Courses Taught (Last 5 Years)

STA10: Basic Statistics and Quantitative Literacy – Duke University, 2008-2010
STA293: Extreme Value Theory and Applications – Duke University, 2009
STA101: Data Analysis and Statistical Inference – Duke University, 2011
STAT693: Paleoclimate Data and Models – The Ohio State University, 2012
ST801: Advanced Spatial Statistics – North Carolina State University, 2012

Recent Graduate Training Experience (Last 5 Years)

Faculty Mentor – Industrial Mathematical & Statistical Modeling Workshop for Graduate Students, North Carolina State University, 2009-2010.
Donald E. K. Martin  
Associate Professor  
Department of Statistics  
Campus Box 8203  
North Carolina State University  
Raleigh, NC 27695-8203  
Telephone: 919-515-1936  
Fax: 919-515-1169  
E-mail: martin@stat.ncsu.edu

Education:

B.S. 1982 University of Maryland, College Park  Mathematics  
M.A. 1987 University of Maryland, College Park  Mathematical Statistics  
Ph.D. 1990 University of Maryland, College Park  Mathematical Statistics

Positions and Employment:


May-August (1997-1999)  NASA-ASEE Summer Faculty Fellow, Goddard Space Flight Center, Greenbelt, Maryland.

1994-2000  Assistant Professor, Mathematics Department, Howard University, Washington, D.C.

2000-2007  Associate Professor, Mathematics Department, Howard University, Washington, D.C.


2007-Present  Associate Professor, Department of Statistics, North Carolina State University

Other Relevant Experiences

2009-Present  Associate Editor for Journal of Statistical Theory and Practice

Selected Peer-Reviewed Publications


**Research Support (Last 3 Years)**

NSF Grant DMS-0805577, 2008-2012, $150,000, “Distributions of Patterns and Statistics in Markovian Sequences”

NSF Grant DMS-1107084, 2011-2014, $100,000, “Distributions of Patterns and Statistics in Random Sequences”

**Courses Taught (Last 5 Years)**

- ST 370 Probability and Statistics for Engineers
- ST 380 Statistics and Statistics for the Physical Sciences
- ST 782 Time Series Analysis (Time Domain)
- ST 783 Time Series Analysis (Frequency Domain)

**Graduate Training Experience (Last 5 years)**

Currently supervise one Ph.D. student (D. Coleman)

**Advised 11 Masters Students in last 3.5 years including current advisees**
HERLE M. McGOWAN
Assistant Professor
Department of Statistics
Campus Box 8203
North Carolina State University
Raleigh, NC 27695-8203
Telephone: 919-515-0634
Fax: 919-515-7591
Email: hmmcgowa@ncsu.edu

Education

<table>
<thead>
<tr>
<th>Degree</th>
<th>Year</th>
<th>Institution</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.A.</td>
<td>2002</td>
<td>Rutgers, The State University of New Jersey</td>
<td>Statistics and Economics</td>
</tr>
<tr>
<td>M.A.</td>
<td>2005</td>
<td>University of Michigan</td>
<td>Statistics</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>2009</td>
<td>University of Michigan</td>
<td>Statistics</td>
</tr>
</tbody>
</table>

Positions and Employment

- 2001–2002 Undergraduate Research Assistant, Center for State Health Policy, Rutgers University
- 2002–2003 Graduate Student Instructor, Department of Statistics, University of Michigan
- 2003–2005 Graduate Student Research Assistant, Institute for Social Research, University of Michigan
- 2006–2007 Graduate Teaching Consultant, Center for Research on Learning and Teaching (CRLT), University of Michigan
- 2005–2009 Graduate Student Instructor, Department of Statistics, University of Michigan
- 2009–present Assistant Professor, Department of Statistics, North Carolina State University

Other Relevant Experience and Professional Memberships

- 2004–2006 Member, Society for Prevention Research
- 2004–present Member, American Statistical Association
- 2010–present Activist, Consortium for the Advancement of Undergraduate Statistics Education (CAUSE)
- 2011–present Academic Advisor, Department of Statistics, North Carolina State University.
- 2012–present Executive Committee At Large, Section on Statistical Education, American Statistical Association

Honors

- 2005–2006 Graduate Student Instructor Excellence in Teaching Award, Department of Statistics, University of Michigan
- 2006–2007 Collaboratory for Advanced Research and Academic Technologies Graduate Student Instructor Fellowship, University of Michigan
- 2007–2008 Outstanding Graduate Student Instructor Award, Rackham Graduate School, University of Michigan
Publications


Research Support

2010–2011 Faculty Research and Professional Development Grant, North Carolina State University, “Exploring and Improving Students’ Reasoning about Statistical Significance.” (Principal Investigator, $4,000).

2011–2012 Large Course Redesign Pilot Grant, Distance Education and Learning Technology Applications, North Carolina State University. (Co-Investigator, $29,783).

Courses Taught

Stats 350 Introduction to Statistics and Data Analysis Department of Statistics, University of Michigan.
ST 311 Introduction to Statistics, Department of Statistics, North Carolina State University.
ST 101 Statistics by Example, Department of Statistics, North Carolina State University.
ST 371 Introduction to Probability and Distribution Theory, Department of Statistics, North Carolina State University.

Recent Graduate Training Experience

Advised 5 Masters Students in last 3 years, including current advisees
JOHN FRANCIS MONAHA N
Professor & Co-Director of the Graduate Program
Department of Statistics
Campus Box 8203
North Carolina State University
Raleigh, NC 27695-8203
Telephone: 919-515-1917
Fax: 919-515-1169
E-Mail: monahan@ncsu.edu

Education
B.S. 1972 Carnegie-Mellon University Mathematics

Positions and Employment
1976-1977 Research Associate, Applied Math Dept, Brookhaven Natl Lab
1977-1978 Assistant Statistician, Applied Math Dept, Brookhaven Natl Lab
1978-1984 Assistant Professor, Department of Statistics, NCSU
1985-1990 Associate Professor, Department of Statistics, NCSU
1990-present Professor, Department of Statistics, NCSU
1994 Acting Department Head, Department of Statistics, NCSU
2011-present Co-Director of Graduate Programs, Department of Statistics, NCSU

Other Relevant Experiences and Professional Memberships
1982, Fall Sabbatical, Institute of Statistical Mathematics, Tokyo.
1983-1987 Editorial Board, Communications in Statististics
1994-1998 Leonard J. Savage Award Committee
1995-1999 NCSU Faculty Senate, PAMS Representative
2006-2008 Chair(incl past & elect), Statistical Computing Section, American Statistical Association

Honors
David D. Mason Award (2003, service award given by NC State Dept. of Statistics)
Fellow of the American Statistical Association (2010)

Selected Peer-Reviewed Publications (Last 5 Years)
J. F. Monahan (2008), A Primer on Linear Models, CRC/Chapman and Hall
Jetton, R. M., Monahan, J. F., and Hain, F. P. (2011). Laboratory studies of feeding and oviposition preference, developmental performance, and survival of the predatory beetle, Sasajiscymnus...
tsugae on diets of the woolly adelgids, *Adelges tsugae* and *Adelges piceae*, *Journal of Insect Science*, 11.68


**Courses Taught (Last 5 Years)**

- ST 445 Introduction to Statistical Computing and Data Management
- ST 552 Linear Models and Variance Components
- ST 590 Special Topics - Computation for Data Analysis
- ST 758 Computation for Statistical Research

**Recent Graduate Training Experience (Last 5 Years) PhD Students Supervised**


Jamila Mathias (2011) "Bivariate Contours for Censored Data" (with Huixia Judy Wang)

**Advised 12 Masters Students in last 3.5 years including current advisees**
RENEÉ H. MOORE
Teaching Associate Professor
Department of Statistics
Campus Box 8203
North Carolina State University
Raleigh, NC 27695-8203
Telephone: 919-513-4895
Fax: 919-515-1169
E-Mail: rhmoore@ncsu.edu

Education
B.S. 1999 Bennett College Mathematics
M.S. 2005 Emory University Biostatistics
Ph.D. 2006 Emory University Biostatistics

Positions and Employment
2006-2012  Assistant Professor of Biostatistics in Biostatistics and Epidemiology at the University of Pennsylvania Perelman School of Medicine
2012-Present  Teaching Associate Professor, Department of Statistics, North Carolina State University

Other Selected Relevant Experiences and Professional Memberships
2008-present  Fostering Diversity in Biostatistics Workshop, Eastern North American Region (ENAR) of the International Biometric Society, (Co-Chair)
2011-present  Predicting Response to Standardized Pediatric Colitis Therapy, National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) multi-site study (Member, Data Safety and Monitoring Board (DSMB))
2011-present  BioMath Module Writer, Center for Discrete Mathematics & Theoretical Computer Science (DIMACS), Rutgers University (Co-Author Chapter for HS BioMath Book)
2011-present  Planning Committee for the 2012 Ivy Plus STEM (Science, Technology, Engineering, and Mathematics) Conference (Member) at the University of Pennsylvania
2012-present  ENAR Regional Advisory Board (Chair)
2012-Present  Data Safety and Monitoring Board (DSMB) (Vascular Inflammation in Psoriasis (VIP) Trial, National Heart, Lung, and Blood Institute (NHLBI) multi-site study, (Member))

Selected Peer-Reviewed Publications (Last 5 Years)


**Selected Research Support (Last 3 Years)**


NIH, R34-DK080473, 2008-2010, $150,000, “Treatment of Early Childhood Overweight in Primary Care: Pilot Study.” Co-Inv (PI: Faith)

Pennsylvania Department of Health, 2007-2010, $813,917, “Primary Care Research Network for the Treatment of Adolescent Obesity”, Co-Inv (PI: Berkowitz)

NIH, 2009-215, $5,495,063.00, “Testosterone Trial.” Biostatistician in Data Coordinating Center (PI: Snyder)

NIH, DK086132, 2009-2012, $174,732.00, “Lifestyle Modification Versus Bariatric Surgery for Type 2 Diabetes.” Co-Inv (PI: Sarwer)

NIH, U01-HL087072, 2006-2012, $813,917.00, “Improving the Management of Obesity in Primary Care Practice.” Co-Inv (PI: Wadden)

NIH, U01-HL083129, 2006-2013, $365,310.00, “A Randomized Controlled Study of Adenotonsillectomy for Children.” Lead Biostatistician in Data Coordinating Center (PI: S. Ellenberg)

**Courses Taught (Last 5 Years)**

- BIOM 520 Using Biostatistics Workshop (2008)
- EPID 802/803 Fundamentals of Biostatistics in Practice (2009-2012)
- ST370 Probability and Statistics for Engineers (2012)
- ST512 Experimental Statistics for Biological Sciences II (2012)

**Recent Graduate Training Experience (Last 5 Years)**

- Academic Advisor to 3 Biostatistics Doctoral Students (2007-2012)
- Biostatistics Advisor to 6 M.S. in Clinical Epidemiology (MSCE) Physicians (2007-2012)
- Biostatistics Advisor to 1M.S. in Health Policy Physician (2009-2011)
- Research Apprenticeship Supervisor to 1 M.S. Student in Statistics, Measurement, Assessment, Research Technology Student (2009-2011)
- Committee Chair for 1 Biostatistics PhD Candidate (2011-2012)
ALISON A MOTSINGER-REIF  
Bioinformatics Research Center  
Department of Statistics  
North Carolina State University (NCSU)  
Raleigh, NC 27695  
Tel.: (919) 515-3574  
Fax: (919) 515-7315  
motsinger@stat.ncsu.edu

EDUCATION  
2003-2007 Vanderbilt University, PhD (Human Genetics)  
2004-2006 Vanderbilt University, MS (Applied Statistics)  
2000-2002 Vanderbilt University, B.S. (Biological Sciences)

POSITIONS  
2012-current Core Director, Bioinformatics Consulting and Service Core, NCSU  
2012-current Associate Professor, Department of Statistics, NCSU  
2011-current Core Director, Biostatistics Core, Center for Comparative Medicine and Translational Research, College of Veterinary Medicine, NCSU  
2008-current Associate faculty, Department of Genetics, NCSU  
2007-2012 Assistant Professor, Department of Statistics, NCSU  
2007-current Adjunct Professor, University of North Carolina at Chapel Hill

HONORS, AWARDS  
2009 Special Contribution Award, The International Conference on Genomics and Bioinformatics for Clinical Application and Risk Assessment

SELECTED PEER REVIEW PUBLICATIONS (of 99 total)  

RESEARCH SUPPORT (LAST 3 YEARS)  
NIH 2012 $19,874, “Metabolomics Network for Drug Response Phenotype”, Role: PI of Subcontract  
NCSU Research and Innovation Seed Funding Program 2012-2013 $25,000, “Immunogenomics of the Endangered Wyoming Toad” Role: Co-Investigator
NIH Heart, Lung and Blood Institute, 2012–2016 $386,834, “Exome-Wide Association Study of ACCORD Lipid Trial”, Role: Co-Investigator and PI of Subcontract
National Cancer Institute, 2012–2016 $1,841,117, “Genetic Etiology of Cancer Drug Response”, Role: PI
The University of North Carolina General Administration 2012 $55,000, “Bioinformatics Equipment Funds” Role: PI
NIH 2009–2011 $178,970, “Swine Models of Structural Birth Defects”, Role: Co-investigator (PI: Kate Ackerman)
The North Carolina Translational and Clinical Sciences Institute 2010–2011 $429, “The Role of the Vitamin D Receptor and Vitamin D Deficiency in Children and Adults with Sickle Cell Disease - Phase I” Role: PI of subcontract
Abbot Laboratories 2010 $119,735, “Prognostic significance of select canine chromosomal regions in canine lymphoma patients treated with CHOP-based therapy.” Role: Co-investigator
Lineberger Cancer Center 2009–2010 $289,134, “Integrated Molecular Characterization of Naturally Occurring B-Cell Lymphomas in Dogs For Use as a Relevant, Large Animal Model of Human DLBCL.” Role: Co-investigator

COURSES TAUGHT (LAST 5 YEARS)
Readings (PP810/PP610)
Bioinformatics Consulting (STAT 610/ STAT 810)
Statistical Genetics Practicum (STAT 498, ST489)
Introduction to Statistics (STAT 311)

RECENT GRADUATE TRAINING EXPERIENCE

Current PhD Students
2011-current Skylar Marvel, Bioinformatics Graduate Program
2010-current Ronglin Che, Bioinformatics Graduate Program
2010-current Siddharth Roy, Statistics Graduate Program

Past PhD Students
2010-2012 Chad Brown, Statistics Graduate Program
2009-2012 Gunjan Hariani, Bioinformatics Graduate Program
2008-2012 Noffisat Oki, Bioinformatics Graduate Program
2008-2011 Stacey Winham, Statistics Graduate Program

Advised 10 Masters Students in last 3.5 years including current advisees
SPENCER V. MUSE
Professor
Department of Statistics and Bioinformatics Research Center
Campus Box 7566
North Carolina State University
Raleigh, NC 27695-7566
Telephone: 919-515-1948
Fax: 919-515-7315
e-mail: muse@ncsu.edu

Education
B.S. 1989 North Carolina State University  Statistics
Ph.D. 1993 North Carolina State University  Statistics and Genetics
Postdoc 1996 The Pennsylvania State University  Molecular Evolutionary Genetics

Positions and Employment
1996-1998  Assistant Professor, Division of Biological Sciences, University of Missouri
1998-  Assistant (-2003), Associate (-2008), Full Professor, Department of Statistics, NCSU

Other Relevant Experiences and Professional Memberships
2007-  Director, NIH Predoctoral Training Grant Biostatistics Training in the Omics Era
2011-  co-Director, NCSU Genomic Sciences Graduate Program (Coordinator, Bioinformatics)
1999-2004  Editorial Board, Systematic Biology
2003-2010  Associate Editor, Molecular Biology and Evolution
2005-2010  Associate Editor, Genetics
2005-2012  Associate Editor, Journal of Experimental Zoology
2003-2006  NIH Biodata Management and Analysis (BDMA)
2007-2009  NIH Continued Maintenance and Support of Software (ZRG1 BST-Q01) (2009, Chair)
2009-  NIGMS Biomedical Research and Research Training, Reviews Subcommittee B (BRT-B)
2000-  Service on approximately 15 other NIH study sections as temporary member, 3 as Chair
2000-  Service on approximately 10 grant panels for NSF or other agencies

Honors
1997-2000  NSF/Alfred P. Sloan Foundation Young Investigator Award in Molecular Studies of Evolution

Software Engineering
Selected Peer-Reviewed Publications (Last 5 Years)


Research Support (Last 3 Years)


Courses Taught (Last 5 Years)

ST 305  Statistical Methods
ST 311  Introduction to Statistics
ST 590A  Bioinformatics I
ST 590C  Bioinformatics II
ST 810A  Preparation for Statistical Research
ST 810E  Ethics in Statistics

Recent Graduate Training Experience (Last 5 Years)

Currently supervise two Ph.D. students (R. Marceau, S. Wilson)
Recent PhD Students: E. Strain (2006); F. Mannino (2006)
Advised 6 Masters Students in last 3.5 years including current advisees.
Jason A. Osborne
Associate Professor
Department of Statistics
Campus Box 8203
North Carolina State University
Raleigh, NC 27695-8203
Telephone: 919-515-1922
Fax: 919-515-1169
E-Mail: jaosborn@ncsu.edu

Education
B.S. 1991 University of California at Santa Barbara Mathematics
M.S. 1994 Northwestern University Statistics
Ph.D. 1997 Northwestern University Statistics

Positions and Employment
1997-2001 Assistant Professor, Department of Discrete & Statistical Sciences, Auburn University
2001-2007 Assistant Professor, Department of Statistics, NCSU
2007-Present Associate Professor, Department of Statistics, NCSU

Other Relevant Experiences and Professional Memberships

Selected Peer-Reviewed Publications (Last 5 Years)


**Research Support (Last 3 Years)**


**Courses Taught (Last 5 Years)**

ST 511 Experimental Statistics I
ST 512 Experimental Statistics II
ST 641 Statistical Consulting
ST 421 Mathematical Statistics I
ST 422 Mathematical Statistics II
ST 711 Design of Experiments

**Recent Graduate Training Experience (Last 5 Years)**

**Ph.D Students Supervised**


**Other advising**

Advised/advising 28 Students (many from other departments) in last 2 years including current advisees
SASTRY G. PANTULA  
Professor  
Department of Statistics  
Campus Box 8203  
North Carolina State University  
Raleigh, NC 27695-8203  
Telephone: 919-515-1949  
Fax: 919-515-7591  
E-Mail: pantula@ncsu.edu

Education

B. Stat.  1978  Indian Statistical Institute, Kolkata, Statistics  
M.Stat.  1979  Indian Statistical Institute, Kolkata, Statistics  
Ph.D.  1982  Iowa State University, Ames, IA, Statistics

Positions and Employment

8/1982 - 6/1988:  Assistant Professor, Department of Statistics, NCSU  
7/1988 - 6/1994:  Associate Professor, Department of Statistics, NCSU  
9/1994 - 8/2002:  Director of Graduate Programs, Department of Statistics, NSU  
1/2000 - 8/2002:  Assistant Head, Department of Statistics, NCSU  
8/2002 - 7/2009:  Director, Institute of Statistics, NCSU  
8/2002 - 9/2010:  Head, Department of Statistics, NCSU  
7/1994 - Present:  Professor, Department of Statistics, NCSU  
9/2010 - Present:  Division Director, Division of Mathematical Sciences, NSF

Other Relevant Experiences and Professional Memberships

8/1990 - 3/1991:  Scholarly Assignment, SEMATECH, Austin, TX  
1/1987 - 12/1993:  Associate Editor, The American Statistician  
1/2000 - 12/2002:  Co-Editor, Sankhya  

Honors

George Snedecor Award, Department of Statistics, Iowa State University, 1981  
Member of Honor Societies: Phi Kappa Phi, Sigma Xi, and Mu Sigma Rho  
Outstanding Teacher Award, North Carolina State University, 1986  
D.D. Mason Faculty Award, Department of Statistics, North Carolina State University, 2001  
Young Statistician Award, International Indian Statistical Association, 2002  
Fellow, American Statistical Association, 2002  
Department Head Award, SAA-PAMS, North Carolina State University, 2005  
Department Head Award, SAA-PAMS, North Carolina State University, 2008  
President, American Statistical Association, 2010
(served as the President Elect in 2009 and as the Past President in 2011)

**Fellow, American Association for Advancement of Science, 2011**

**NSF Director’s Awards for Collaborative Integration:** 2012

1. IGERT-CIF21 Science and Engineering Collaboration
2. Collaboration for Successful Launch of Ground Breaking International Initiatives
3. HER-MPS Cross-Directorate Team

**Selected Peer-Reviewed Publications** (Last 5 years)


**Research Support** (Last 3 years)

- NSF VIGRE-II DMS 0354189 “Integrated and Mentored Program of Research and Education in Statistical Sciences (IMPRESS)”, 2004-2010, $2,650,000; Co-PI with Stefanski, Davidian, Gerig, Fuentes.
- NSF CSUMS DMS 0703392 “Computation for Undergraduates in Statistic Program (CUSP)”, 2007-2010, $450,000; Co-PI with Ghosh, Gumpertz, Zhang, Woodard.
- NSF S-STEM DUE 0806909 “Mentoring for Total Success”, 2008-2010, $600,000; Co-PI with Arroway, Ghosh, Hughes-Oliver, Woodard, Weems.

**Courses Taught** (Last 5 years)

- ST782  Time Series Analysis: Time Domain

**Recent Graduate Training Experience** (Last 5 years)

Currently, I am not supervising any graduate students. Served on some doctoral committees over the past five years.

**Ph.D. Students Supervised** (Last 5 years)


**M.S. Students Advised** (Last 5 years)

None
KENNETH H POLLOCK
Professor
Department of Biology (and Statistics)
Campus Box 7617
North Carolina State University
Raleigh, NC 27695-7617
Telephone: 919-513
E-Mail: pollock@ncsu.edu

Education
B.Sc 1968 University of Sydney Australia Agriculture
MS 1972 Cornell University Biometrics
Ph.D 1974 Cornell University Biometrics

Positions and Employment
1974-1978 Lecturer, Department of Applied Statistics, University of Reading, England
1979-1980 Associate Professor, Department of Statistics, University of California, Davis
1980-1987 Associate Professor, Department of Statistics, NCSU
1987-2003 Professor, Department of Statistics, NCSU
2003-2009 Professor, Department of Biology, NCSU
2009-2011 Professor, Fisheries Centre, Murdoch University Australia
2012- Professor, Department of Biology, NCSU

Other Relevant Experiences and Professional Memberships
1997 Bureau of Resource Sciences, Canberra Australia
2002 James Cook University, Australia and Universities of Hong Kong and Peking, PRC
2009- 2010. Associate Editor- Journal of Wildlife Research,
1984-1989, 2000 – 2004 Associate Editor- Biometrics,
1994 – 2003, 2011- Associate Editor- Journal of Environmental and Ecological Statistics, 2000-
2002 Associate Editor- American Statistician,
1989-1991 Associate Editor- Journal of Wildlife Management,
2005-2006 NRC, National Academy of Sciences, Review Panel on Rec Fisheries Surveys
2002-2003. Member of National Review Panel on the Status of the Manatee,

Honors
Twentieth Century Distinguished Service Award in Environmental Statistics.
David Mason Award Best Faculty Member in Statistics 1996, NCSU
Best Paper Award, 1994, Southeastern Section of the Wildlife Society.
Distinguished Achievement Award, ASA Section on Statistics and the Environment, 1994.
George W. Snedecor Memorial Award, August 1991, ASA best publication in Biometrics
Best Monograph Award, 1990, Wildlife Society
Best Paper Award, 1989, Wildlife Society
Best Paper Award, 1989, Southeastern Section of the Wildlife Society
Best Paper Award, 1982, Southeastern Section of the Wildlife Society
Selected Peer-Reviewed Publications (Last 5 Years)

Research Support (Last 3 Years)
None in USA. Many grants in Australia 2009-2011.

Courses Taught (Last 5 Years)
ST 506 Sampling Animal Populations

Recent Graduate Training Experience (Last 5 Years)
Currently co-supervise 5 Ph D students at Murdoch University

Ph.D Students Supervised
2007 Jun Yoshizaki Biomathematics
2008 Emily H. Griffith Statistics
2009 Stephen Stanislav Statistics
2009 Zhi Wen Statistics
2009 Matthew Krachey Biomathematics

Advised 0 Masters Students in last 3.5 years including current advisees 0.
Brian J. Reich  
Assistant Professor  
Department of Statistics  
North Carolina State University  
E-Mail: brian_reich@ncsu.edu

Education
B.S.  1999 University of Wisconsin - River Falls  Mathematics
M.S.  2002 University of Minnesota  Biostatistics
Ph.D.  2005 University of Minnesota  Biostatistics

Positions and Employment
2005-2008  Postdoctoral fellow, Department of Statistics, NCSU
2008-Present  Assistant professor, Department of Statistics, NCSU

Other Relevant Experiences and Professional Memberships
2008-2011  Associate Editor for the Journal of Agricultural, Biological, and Environmental Statistics (JABES) and the Annals of Applied Statistics
2011  Guest Co-Editor of JABES, special issue on “Computer models and spatial statistics for environmental science”
2012  Organizer of the ASA Statistics and the Environment Section (ENVR) Workshop
2013-2015  Member of the ENAR Student Paper Awards Committee
2012-2013  ENVR representative on the ENAR Program Committee

Honors

Selected Peer-Reviewed Publications (Last 5 Years)
Bondell HD, Reich BJ. Consistent high-dimensional Bayesian variable selection via penalized credible regions. Accepted, Journal of the American Statistical Association.
Reich BJ, Bandyopadhyay D (2010). A latent factor model for spatial data with informative miss-
Simultaneous regression shrinkage, variable selection and clustering of predictors with OSCAR. *Biometrics*, **64**, 115–123.

**Research Support (Last 3 Years)**


Studying the associations between manganese exposure and childhood development in North Carolina (2012-2013). North Carolina Division of Public Health. PI. Total funding, $15,000.


**Courses Taught (Last 5 Years)**

- ST 521 Statistical Theory I
- ST 740 Bayesian Inference
- ST 733 Applied Spatial Statistics
- ST 514 Statistics for Management and the Social Sciences II
- ST 430 Introduction to Regression Analysis
- ST 371 Introduction to Probability and Distribution Theory
- ST 810 Preparation for Statistical Research

**Recent Graduate Training Experience (Last 5 Years)**

Currently supervising one postdoctoral fellow (Earvin Balderama) and eight doctoral students (Laura Boehm, Yimin Kao, Ander Wilson, Danny Modlin, Luke Smith, Morgan Lennon, Colin Peterson and Ryan Parker).

**Ph.D Students Supervised**


**Advised 8 Masters Students in last 3.5 years including current advisees**
THOMAS W. REILAND  
Associate Professor, Statistics and Operations Research  
Department of Statistics, Graduate Program in Operations Research  
Campus Box 8203  
North Carolina State University  
Raleigh, NC 27695-8203  
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Fax: 919-515-7591  
E-mail: reiland@stat.ncsu.edu

Education

B.A. Lewis University 1966-1970 Mathematics  
M.A. Bowling Green State University 1970-1972 Mathematics  
M.S. Florida State University 1972-1974 Statistics  
Ph.D. Florida State University 1974-1977 Statistics

Positions and Employment

1977-1983 Assistant Professor, Department of Statistics and Graduate Program in Operations Research, NCSU  
1983-present Associate Professor, Department of Statistics and Graduate Program in Operations Research, NCSU

Other Relevant Experiences and Professional Memberships

American Statistical Association (sections on Statistical Education and Statistics in Sports)

Honors

Member, Academy of Outstanding Teachers, NCSU, 2003  
Alumni Distinguished Undergraduate Professor Award, 2005  
Undergraduate Research Awards (2) for mentored undergraduate research projects 2007  
David D. Mason Award 2010 (service award given by NCSU Dept. of Statistics).  
Thank A Teacher Award, Fall 2011, Spring 2012.

Selected Peer-Reviewed Publications (last 5 years)


Research Support (last 3 years)

None
Courses Taught (last 5 years)

ST 101 Statistics by Example
ST 302 Statistical Methods II
ST 305 Statistical Methods
ST 311 Introduction to Statistics (face-to-face lecture and distance education)
ST 311 Introduction to Statistics (special section: statistics in sports)
BUS/ST 350 Economic and Business Statistics (face-to-face lecture and distance education)
ST 498 Independent Study (Vigre research)
ST 511 Statistics for the Biological Sciences I
OR 501 Introduction to Operations Research
OR/MA 504 Introduction to Mathematical Programming
OR 506 Algorithmic Methods in Nonlinear Programming
OR/ST/MA 706 Nonlinear Programming
AA 502 (Advanced Analytics Institute) Mathematical Programming for Analytics

Recent Graduate Training Experience (last 5 years)

Advised 12 Masters Students in last 3.5 years including current advisees
ARMIN SCHWARTZMAN  
Assistant Professor  
Department of Biostatistics  
Harvard School of Public Health  
Boston, MA 02115  
armins@hsph.harvard.edu

**Education/Training**  
Technion - Israel Institute of Technology  B.S.  1991-1995  Electrical Engineering  
California Institute of Technology  M.S.  1995-1996  Electrical Engineering  
Technion - Israel Institute of Technology  B.S.  1999-2001  Science Education  
Stanford University  Ph.D.  2001-2006  Statistics

**Positions and Employment**  
1999–2001  Algorithm Developer and Researcher, Biosense Webster (Israel) Ltd., Haifa, Israel  
2003  Summer Intern, Daimler Chrysler Research and Technology North America, Palo Alto, CA  
2006–2007  Research Fellow, Department of Biostatistics and Computational Biology, Dana-Farber Cancer Institute, Boston, MA  
2009  Visiting Scientist, Department of Industrial Engineering and Management, Technion - Israel Institute of Technology  
2007–Present  Assistant Professor, Department of Biostatistics, Harvard School of Public Health, and Department of Biostatistics and Computational Biology, Dana-Farber Cancer Institute, Boston, MA

**Other Relevant Experiences and Professional Memberships**  
Member  Institute of Mathematical Statistics; American Statistical Association

**Selected Peer-Reviewed Publications (Last 5 Years)**  
Selected Research Support (Last 3 Years)

5P01 CA134294-02 (Lin, Xihong) 9/1/2008–8/31/2013
NCI (Subcontract from: HSPH) $18,009
Statistical Informatics for Cancer Research (Project 3)
Role: Co-PI

Dana Fund Award 9/1/2010-8/31/2011
DFCI $75,000
Statistical Parametric Imaging for Response Assessment of Novel Therapy in Neuro-Oncology
Role: PI

Career Incubator Fund 9/1/2010-8/31/2011
Harvard School of Public Health $50,000
Fresh water and climate change: estimation of mountain glacier retreat via analysis of satellite imagery
Role: PI

1R21 EB012177-01 (Lepore, Natasha) 3/15/2011—2/28/2013
NIH (Subcontract from: Children’s Hospital Los Angeles) $50,000
Statistical Methods for Brain Image Registration and Tensor-Based Morphometry
Role: Co-Investigator

1R01 CA157528-01 4/1/2012–6/30/2010
NCI $288,711
Multiple testing methods for random fields and high-dimensional dependent data
Role: PI

Courses Taught (Last 5 Years)

Probability Theory I Harvard School of Public Health 2008-2011
Introduction to Time Series and Forecasting Technion - Israel Institute of Technology 2009
Statistical Inference II Harvard School of Public Health 2012

Recent Graduate Training Experience (Last 5 Years)

2011–Present Denis Agniel, PhD student, large-scale multiple testing
2010–2012 Nezamoddin Nezamoddini-Kachouie, Post-doctoral fellow, image analysis, bioinformatics
2010–2011 Travis Gerke, PhD student, image analysis
2010–2011 James Winter, undergraduate student, image analysis
2009–2010 Mengye Guo, Research Scientist, medical image analysis
2008–2010 Yulia Gavrilov, post-doctoral fellow, multiple testing
2009–2010 Melissa Naylor, postdoctoral fellow, medical image analysis
2008–2009 Roman Torgovisky, post-doctoral fellow, nonparametric regression
2008–2009 Bike Kilic, Master’s project, image registration
CHARLES EUGENE SMITH
Associate Professor
Department of Statistics
Biomathematics Program
Campus Box 8203
North Carolina State University
Raleigh, NC 27695-8203
Telephone: 919-515-1907
Fax: 919-515-1169
E-Mail: bmasmith@ncsu.edu

Education
B.S. 1972 M.I.T Physics
M.S. 1973 The University of Chicago Theoretical Biology
Ph.D. 1979 The University of Chicago Biophysics and Theoretical Biology

Positions and Employment
1980-1983 Assistant Professor, Biometry Dept., Medical University of South Carolina, Charleston, SC
1983-1989: Assistant Professor, Department of Statistics, Biomathematics Graduate Program, North Carolina State University
1989 -Present Associate Professor, Department of Statistics, Biomathematics Graduate Program, North Carolina State University

Other Relevant Experiences and Professional Memberships
1979 -1980 N.I.H. Cardiometrician Postdoctoral Fellow Biometry Dept., Medical University of South Carolina, Charleston, SC
1981-1982: Co-Director Cardiometrician training grant from NIH (NHBLI), MUSC, Charleston, SC
1995-2002 Secretary, Society for Mathematical Biology
1997 Co-Chair, Society of Mathematical Biology Annual Meeting
1999,Summer Sabbatical, Czech Academy of Sciences, Prague, Czech Republic
1999, Fall Sabbatical, Dept. Bio-Engineering, Osaka Univ., Japan
2000 Chair, Gordon Conference on Theoretical Biology and Biomathematics
8/2003-7/2005 Interim Director of Biomathematics Graduate Program, North Carolina State University
5/2007 - 7/2007 Interim Director of Biomathematics Graduate Program, North Carolina State University
9/2005-12/2005 Gilbert Beebe Fellow at Radiation Effects Research Foundation, Hiroshima, Japan
2006,summer Chair, SMB-SIAM Life Sciences Annual Mtg,( 553 participants)
2008-present Board of Editors, Scientiae Mathematicae Japonicae
Selected Peer-Reviewed Publications (Last 6 years)


Courses Taught (Last 5 Years)

ST 370 Statistics for Engineers
ST 371 Intro. to Probability and Distribution Theory
ST/BMA/MA/OR 773 Stochastic Modeling
ST/MA 746 Intro. to Stochastic Processes

Ph.D Students Supervised


Mamiko Arai (2010), "Investigation of Different Input Noise Types in Linear and Nonlinear Stochastic Neural Models"

Zhi Wen (2009), "Super Population Capture-Recapture Model Augmented with Genetic Data." (with Ken Pollock)


Te-Hsin Lung (1998), "Approximations for Skewed Probability Densities Based on Laguerre Series and biological Applications"

Advised 6 Masters Students in last 3.5 years including current advisees
Rui Song  
Assistant Professor  
Department of Statistics  
Campus Box 8203  
North Carolina State University  
Raleigh, NC 27695-8203  
Telephone: 919-515-1955  
Fax: 919-515-1169  
E-Mail: rsong@ncsu.edu

Education
B.S. 2001 Peking University Probability and Statistics
Ph.D. 2006 University of Wisconsin-Madison Statistics

Positions and Employment
2006-2008 Postdoc, Department of Biostatistics, University of North Carolina at Chapel Hill
2008-2009 Postdoc, Department of Operation Research and Financial Engineering, Princeton University
2009-2012 Assistant Professor, Department of Statistics, Colorado State University
2012-Present Assistant Professor, Department of Statistics, NCSU

Honors
ENAR Distinguished Student Paper Award, The International Biometric Society, 2006.

Selected Peer-Reviewed Publications (Last 5 Years)


**Research Support (Last 3 Years)**

NSF grant DMS-1007698, 2010-2013, $100,000, “Variable Selection Methods in High Dimensional Feature Space,” PI.

**Courses Taught (Last 3 Years at Colorado State University)**

- ST 501 Statistical Science
- ST 640 Design and Linear Modeling
- ST 740 Introduction to Empirical Processes and Semiparametric Inference
- ST 305 (Fall 10) Sampling Techniques

**Recent Graduate Training Experience (Last 3 Years at Colorado State University)**

Advised 1 Master Student in last 3 years
ANA-MARIA STAICU  
Assistant Professor  
Department of Statistics  
Campus Box 8203  
North Carolina State University  
Raleigh, NC 27695-8203  
Telephone: 919-515-0644  
Fax: 919-515-1169  
E-Mail: ana-maria_staicu@ncsu.edu

Education  
B.S. 2000 University of Bucharest, Romania Mathematics  
M.S. 2002 University of Toronto, Canada Statistics  
Ph.D. 2007 University of Toronto, Canada Statistics

Positions and Employment  
2007-2009 Brunel Postdoctoral Research Fellow, Department of Mathematics, University of Bristol, UK  
2009-Present Assistant Professor, Department of Statistics, NCSU

Other Relevant Experiences and Professional Memberships  
2007, 2008, 2010, two-weeks visit Johns Hopkins University, Department of Biostatistics  
2008, 2009, two-weeks visit Texas A & M, Department of Statistics  
2011- Associate Editor for Biometrics  
2012- Associate Editor for Stat

Honors  
NSERC Canada Graduate Scholarships (CGS D) (2005, scholarship given to the highest-ranked postgraduate applicants of Canada)  
Department of Statistics Doctoral Award, University of Toronto (2006)

Selected Peer-Reviewed Publications (Last 5 Years)  
Crainiceanu CM, Staicu, A.M. Comments on ”Clustering random curves under spatial interdependence with application to service accessibility” by H. Jiang and N. Serban, *Technometrics*, to appear  


Research Support (Last 3 Years)

NSF Grant 552095 2010-2013 $125,000 Statistical methods for spatially correlated hierarchical functional data, PI

Courses Taught (Last 5 Years)

ST 370 Probability and Statistics for Engineers
ST 732 Applied Longitudinal Data Analysis

Recent Graduate Training Experience (Last 5 Years) N/A

Advised 11 Masters Students in last 3.5 years including current advisees
LEONARD A. STEFANSKI
Drexel Professor of Statistics
Department of Statistics
North Carolina State University

Education
B.S. 1979 University of Connecticut Mathematics
M.S. 1983 University of North Carolina, Chapel Hill Statistics
Ph.D. 1984 University of North Carolina, Chapel Hill Statistics

Positions and Employment
1981, Summer Statistician, Mathematics Division, Army Research Office, RTP, NC
1981-1983 Statistician, Environmental Protection Agency, RTP, NC
1984-1986 Assistant Professor, Department of Economic and Social Statistics, Cornell University

Other Relevant Experiences and Professional Memberships
1988, Summer Visiting Professor, Department of Biostatistics, Harvard University
2001 BEIR VII Committee on the Health Risks of Ionizing Radiation, NAS.
2003, December NSF Statistics and Probability Screening Panel
2004, December NSF VIGRE Review Panel
2010, November Mathematical Challenges for Sustainability Panel
2010–2013, Editorial Board Significance
2011-2013, Screening Editor, Statistica Sinica
2011, January NF Statistics and Probability Screening Panel

Honors
2009 Drexel Professor of Statistics
2005 Dave Mason Award (NCSU Department of Statistics Service Award)
1998 Fellow of the American Statistical Association

Selected Peer-Reviewed Publications (Last 5 Years)


**Research Support (Last 3 Years)**

NIH Grant 2000-2012 $2,453,238; “Flexible Statistical Methods for Biomedical Data.” Co-I with M. Davidian and others.

NIH Grant 2007-2010 $758,328, “Engaging the Next Generation of Biostatisticians.” Co-I with M. Davidian


**Courses Taught (Last 5 Years)**

ST 552, Linear Models ST 810, Measurement Error Models (special topics)

**Recent Graduate Training Experience (Last 5 Years)**

PhD Current (5): A. Unfried (with D. Boos); K. White (with Y. Wu); G. Xu; K. Linn (with E. Laber); K. Talapatra (with E, Laber).

PhD Completed: E. Reyes 2011 (with D. Boos); J. Duan 2011 (with D. Boos); L. Thomas 2009 (with M. Davidian); D. Schumann 2009 (with D. Boos); B. Ogerek 2008; H. Crews 2008; (with D. Boos).

Advised 5 Masters Students in last 3.5 years including current advisees
ERIC A. STONE
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DEPARTMENTS OF GENETICS AND STATISTICS
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North Carolina State University
Raleigh, NC 27695-7566
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E-MAIL ADDRESS eric_stone@ncsu.edu

Education/Training
B.S. Mathematics, University of Florida, 1993-1996
Ph.D. student, Mathematics, Princeton University, 1996-1997
M.S. Statistics, Stanford University, 1999-2000
Ph.D. Statistics, Stanford University, 2000-2004
Postdoctoral associate, Genetics and Pathology, Stanford University, 2004-2005

Positions and Employment
Assistant Professor of Statistics, NC State University, 2005-2010
Assistant Professor of Genetics, NC State University, 2010-2011
Associate Professor of Genetics, NC State University, 2011-present
Associate member of Statistics (minority appointment), NC State University, 2011-present

Selected Peer-Reviewed Publications (selected from 37 in last 5 years)

11. Mackay TFC, **Stone EA**, Ayroles JF
   The genetics of quantitative traits: challenges and prospects. *Nature Reviews Genetics* 2009, 10: 565-577


13. Stone EA, Ayroles JF

14. Harbison ST, Carbone MA, Ayroles JF, **Stone EA**, Lyman RF, Mackay TFC

Research Support (Last 3 Years)

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<tr>
<th>Grant Number</th>
<th>Description</th>
<th>Dates</th>
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<tr>
<td>NIH R01GM045146</td>
<td>Quantitative trait loci in <em>Drosophila</em></td>
<td>7/01/09 – 6/30/13</td>
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<tr>
<td>NIH R01GM076086</td>
<td>Genetics of aggression in <em>Drosophila</em></td>
<td>7/01/12 – 6/30/16</td>
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<td>NIH R01GM070806</td>
<td>Evolutionary inferences from protein-coding genes</td>
<td>8/01/10 – 7/31/14</td>
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<td>NIH R01GM098287</td>
<td>High throughput <em>S. cerevisiae</em> HAM, GWA &amp; QT/QTL architecture</td>
<td>8/01/11 – 5/31/15</td>
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<tr>
<td>NSF DMS1122527</td>
<td>Partially-supplied graphs as a unifying concept in biology</td>
<td>10/01/11 – 9/30/14</td>
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Courses Taught (Last 5 Years)

ST 590A (annually each Fall), PP 610G/810G (4x in last 5 years, most recently in Spring 2010)

Recent Graduate Training Experience (Last 5 Years)

Currently supervise one Genetics Ph.D. student (S. Vensko); graduated students below:


Jonathan Keebler, Ph.D. Bioinformatics (2010), “Spontaneous Mutation Discovery via High-Throughput Sequencing of Pedigrees”

Lisa McFerrin, Ph.D. Bioinformatics (2010), “Modeling the Molecular Evolution of Protein Domains and Networks.”

Jeff Thorne  
Professor of Genetics and Statistics  
North Carolina State University  
Telephone: 919-515-1946  
Fax: 919-515-7315  
E-Mail: thorne@statgen.ncsu.edu

Education
B.S. 1986  University of Wisconsin – Madison  Mathematics, Molecular Biology  
Ph.D. 1991  University of Washington, Genetics

Positions and Employment
1992-1993 Postdoctoral Associate, Biometrics Unit, Cornell University  
1993-1999 Assistant Professor, Statistics, North Carolina State University  
1999-2001 Associate Professor, Statistics, North Carolina State University  
2001- 2005 Associate Professor, Genetics and Statistics, N. C. State University  
2005- 2012 Professor, Genetics and Statistics Departments, N.C. State University

Other Relevant Experiences and Professional Memberships
Member (1997-2001, 2002-2003) and Chair (2001-2002) N.C.S.U. Undergraduate Admissions Committee; Member, N.C.S.U. College of Agriculture and Life Sciences Reappointment, Promotion, and Tenure Committee (2007-2009); Member, N.S.F. Computational Biology Review Panel (1997-1999); Contributing Editor, Current Index to Statistics (Summer 199-Spring 2000); Associate Editor (2001-2004) and Editorial Board Member (2004-2009), Systematic Biology (2001-2004); Associate (2007-2012) and Senior (2012-?) Editor, Molecular Biology and Evolution (2007-present); Faculty Member in Evolutionary/Comparative Genetics, Faculty of 1000 (2004-2010); Honorary Editorial Board Member for Evolutionary Bioinformatics; Editorial Board Member, Journal of Experimental Zoology-B: Molecular and Developmental Evolution (2006-present); External Program Reviewer, N.S.F. EPSCOR Ecological Genomics Initiative at University of Kentucky (2010-present); Member, Board of Scientific Counselors, National Institutes of Environmental Health Sciences (2008-2011); Member, Operations Committee, National Evolutionary Synthesis Center, Durham NC (2009-present); Member, NIH Genetic Variation and Evolution Study Section (2012-present); etc.

Honors
Univ. of Washington Graduate School Recruitment Fellowship (1986-1987)  
National Science Foundation Graduate Fellowship (1987-1990)  
Sloan Foundation Young Investigator Award in Molecular Evolution (1995)  
Wissenschaftskolleg zu Berlin fellowship (2006–2007)

Five selected peer-reviewed publications from last 5 years


**Research Support (Last 3 years)**


**Courses Taught or Co-Taught (Last 5 years):** GN 756 / ST756 (Computational Molecular Evolution), ST590C (Bioinformatics II), GN 311H (Principle of Genetics for honors students), GN 703 (Population and Quantitative Genetics)

**Recent Graduate Training Experience (Last 5 years)**

**Finished:** M.S. Student Eric Lassiter (Genetics, 2010, co-chair with Dr. J. Ristaino), Ph.D. Student Sang Chul Choi (Bioinformatics, 2007)

**Current:** Ph.D. Students Supervised: Kristin Lamm (Bioinformatics), Hui-Jie Lee (Statistics), Kuangyu Wang (Bioinformatics)


**Advised 0.5 Masters Students in last 3.5 years**
ANASTASIOS A. TSIATIS
Gertrude M. Cox Distinguished Professor of Statistics
Department of Statistics
Campus Box 8203
North Carolina State University
Raleigh, NC 27695-8203
Telephone: 919-515-1928
Fax: 919-515-1169
E-Mail: tsiatis@ncsu.edu

Education
B.S. 1970 Massachusetts Institute of Technology Mathematics
Ph.D. 1974 University of California, Berkeley Statistics

Positions and Employment
1974–1979 Assistant Professor, Departments of Statistics, University of Wisconsin
1980–1981 Associate Member, Biostatistics Division, St. Jude Children’s Research Hospital
1981–1990 Associate Professor, Department of Biostatistics, Harvard School of Public Health
1990–1997 Professor of Biostatistics, Department of Biostatistics, Harvard School of Public Health
1997–2010 Professor, Department of Statistics, North Carolina State University
2010–Present Gertrude M. Cox Distinguished Professor of Statistics, Department of Statistics, NCSU

Other Relevant Experiences and Professional Memberships
1988–1994 Associate Editor for Statistics and Probability Letters
1995–1998 Associate Editor for Annals of Statistics
1996–2006 Associate Editor for Biometrika
1998–Present Series Editor for Statistics for Biology and Health series of Springer-Verlag
2009–Present Editor for Biostatistics

Honors
Spiegelman Award, most outstanding contribution of a young (under 40) statistician in Public Health, 1986
Elected Ordinary Member, International Statistical Institute, 1987
Fellow, American Statistical Association, 1990
Fellow, Institute of Mathematical Statistics, 1993
Snedecor Award, 2001
Received MERIT award from The National Allergy and Infectious Diseases Council, 2003
Princess Lilian Visiting Professorship in Belgium, 2010
Gertrude M. Cox Distinguished Professor of Statistics, 2010

Selected Peer-Reviewed Publications (Last 5 Years) from over 150


**Research Support (Last 3 Years)**

NIH Grant 5 R37 AI031789, 2008,2013, $245,000 “Statistical Methods for AIDS Clinical Trials” PI.

NIH Grant 5 R01 CA51692, 2008-2012, $185,000 “Statistical Analysis of Time to Event Data in Cancer” PI


**Courses Taught (Last 5 Years)**

ST 810 Special Topics - Semiparametric Methods and Missing Data
ST 810 Special Topic - Causal Inference and Dynamic Treatment Regimes

**Recent Graduate Training Experience (Last 5 Years)**

Currently supervise one Ph.D. student (Xiaofei Bai)

**Ph.D Students Supervised**

Jason Brinkley (2008), “A generalized estimator of the attributable benefit of an optimal treatment regime”.


Weihua Cao (2010), “Improving efficiency and robustness of the doubly robust estimator for a population mean with incomplete data” (with Marie Davidian).


**Advised 6 Masters Students in last 3.5 years including current advisees**
Jung-Ying Tzeng
Associate Professor
Department of Statistics and Bioinformatics Research Center
Campus Box 7566, North Carolina State University, Raleigh, NC 27695-7566
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E-Mail: jytzeng@stat.ncsu.edu

Education
B.S. 1994 National Taiwan University Public Health/Epidemiology
M.S. 1997 National Taiwan University Biostatistics
M.S. 2000 Carnegie Mellon University Statistics

Positions and Employment
2003-2010 Assistant Professor, Department of Statistics and Bioinformatics Research Center, NCSU
2010-Present Associate Professor, Department of Statistics and Bioinformatics Research Center, NCSU

Other Relevant Experiences and Professional Memberships
2005-Present Faculty, Genomic Science Graduate Program, NCSU
2008-Present Faculty, Master of Veterinary Public Health Program, NCSU
2008-2009 Faculty Fellow, Statistical and Applied Mathematical Sciences Institute, NC
2007-Present Associate Editor for Biometrics
2010-Present Review Editorial Board for Frontiers in Statistical Genetics and Methodology
2010-Present Editorial Board for Journal of Clinical Bioinformatical Science
2012-Present Editorial Board for ISRN Genetics
2006 Oct Ad hoc Reviewer for NIH Hemostasis and Thrombosis Study Section
2007 Feb Ad hoc Reviewer for NIH Erythrocyte & Leukocyte Biology Study Section
2009 Jun Ad hoc Reviewer for NIMH Grand Opportunities (GO): Genomic Profiling and Genomic Technologies in Mental Disorders
2010 Oct Ad hoc Reviewer for NIH GCAT (Genomics, Computational Biology and Technology) study section
2011 Oct Ad hoc Reviewer for NIH GCAT study section
2012 Oct Ad hoc Reviewer for NIH GCAT study section

Honors
Elected full member of Sigma Xi Scientific Research Society (2004)
Laha Award, Institute of Mathematical Statistics (2003)
Graduate Thesis Award, National Public Health Association, Taiwan (1997)

Selected Peer-Reviewed Publications (Last 5 Years) [* indicates Equal Contribution]


**Research Support (Last 3 Years)**

NIH Grant R01 MH084022-01A1 2009 - 2012, "Genome-wide Haplotype Association Analysis in Mental Disorders,” PI.

NIH Grant P01 CA142538-01, 2010-2015, “Statistical Methods for Cancer Clinical Trials,” co-I.

NIH Grant R01-MH074027, 2006-2009, "Replication of Schizophrenia Associations in CATIE,” co-I and subcontract PI from UNC-CH.

NSF Grant DMS-0504726, 2005-2009, “Haplotype-based Association Modeling for Whole-Genome Scan and Candidate Gene Studies,” PI.

**Courses Taught (Last 5 Years)**

- ST/GN721 Genetic Data Analysis
- PP610G/PP810G Genomic Science Journal Club Spring
- ST511 Experimental Statistics for Biological Science I
- ST361 Introduction to Statistics for Engineers
- ST790G Statistics in Genetic Epidemiology

**Recent Graduate Training Experience (Last 5 Years)**

Currently supervise five Ph.D. students (Jun Hu, Aijing Starr, Xin Wang, Zhi Wang, Guolin Zhao)

**Ph.D Students Supervised**

Martha Jones (2007), "A retrospective method for inference on haplotype main effects and haplotype-environment interactions using clustered haplotypes."

Youfang Liu (2008), "Analytical tools for population-based association studies."


Monnat Pongpanich (2012), "Analytical tools for data management and analysis in modern genetic association studies."

**Advised 7 Masters Students in last 4 years including current advisees**
Huixia Judy Wang
Associate Professor, Department of Statistics
North Carolina State University, Raleigh, NC 27695-8203
Phone: (919) 513-1661, Fax: (919) 515-7591, Email: hwang3@ncsu.edu

Education/Training
1995-1999  B.S., Statistics, Fudan University, Shanghai, China
1999-2002  M.S., Statistics, Fudan University, Shanghai, China
2002-2006  Ph.D., Statistics, University of Illinois at Urbana-Champaign

Positions and Employment
08/2006-present  Assistant Professor, Dept. of Statistics, North Carolina State University

Other Relevant Experiences and Professional Memberships
2006-present  Institute of Mathematical Statistics (lifetime member)
2006-present  International Chinese Statistical Association (lifetime member)
2009-present  American Statistical Association
2010-present  International Biometric Society Eastern North American Region
2010-2011  Guest Editor for the Computational Statistics and Data Analysis (CSDA)
            Special Issue on Quantile Regression and Semiparametric Methods
2011-present  Associate Editor for Journal of the American Statistical Association (T&M)

Honors
2008, Young researcher travel award, Far Eastern and South Asian Meeting of the Econometric Society
2012, Tweedie New Researcher Award from Institute of Mathematical Statistics

Selected Peer-Reviewed Publications (Last 5 Years)


**Research Support (Last 3 Years)**

09/2012-08/2017, NSF DMS-1149355 “CAREER: A new and pragmatic framework for modeling and predicting conditional quantiles in data-sparse regions,” Principal Investigator, $400,000

09/2010-08/2013, NSF DMS-1007420, “Analysis of Incomplete Data in Quantile Regression and Semiparametric Models,” Principal Investigator, $140,000


**Courses Taught (Last 5 Years)**


**Recent Graduate Training Experience (Last 5 Years)**

Currently supervise five Ph.D. students (P. Bernhardt, P. Torres, W. Jang, K. Wang, M. Zhou) in research on missing data, measurement error and quantile regression.

Graduated three Ph.D. students including: Liewen Jiang, 2012, “Methods for Interquantile Shrinkage in Linear Regression Models” (joint with Dr. Bondell); Lei Pang, 2012, ‘Semiparametric Estimation & Inference for Censored Regression Models” (joint with Dr. Lu); Jamila Tulani Mathias, 2011, “Bivariate Contours for Censored Data” (joint with Dr. Monahan).

Advised 9 Masters Students in last 3.5 years including current advisees.

August, 2012
KIMBERLY S. WEEMS
Teaching Associate Professor
Department of Statistics
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North Carolina State University
Raleigh, NC 27695-8203
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Fax: 919-515-1169
E-Mail: ksweems@ncsu.edu

Education
B.S. 1993 Spelman College Mathematics
M.A. 1996 University of Maryland Applied Mathematics
Ph.D. 2000 University of Maryland Applied Mathematics (Statistics concentration)

Positions and Employment
2001-2004 Postdoctoral Research Associate, Department of Statistics, NCSU
2004-2009 Teaching Assistant Professor, Department of Statistics, NCSU
2009-present Teaching Associate Professor, Department of Statistics, NCSU

Other Relevant Experiences and Professional Memberships
2002, Summer Visiting Scholar, Department of Statistics and Operations Research, University of Alicante, Spain
2008, Spring Fellow, Statistical and Applied Mathematical Sciences Institute
2012, Summer Interim Co-Director of Graduate Programs, NCSU

Honors
Thank a Teacher Award, Office of Faculty Development, NCSU (2011)
Award for Teaching Excellence, College of Physical and Mathematical Sciences, NCSU (2008)
Service Award, College of Physical and Mathematical Sciences, NCSU (2008)
Outstanding Faculty Award, College of Physical and Mathematical Sciences, NCSU (2005)
Advocacy Award, Association for the Concerns of African-American Graduate Students, NCSU (2005)

Selected Peer-Reviewed Publications (Last 5 Years)

Research Support (Last 3 Years)
NSF Grant DUE-0806909, 2008-2013, $600,000, “Mentoring Students to Total Success,” co-PI with Ghosh, Hughes-Oliver and Woodard (PI).

NIH Grant 5 T15 HL075859-07, 2003-2010, $1,567,741, “Engaging the Next Generation of Biostatisticians,” Co-investigator and Recruitment Specialist with Davidian (co-PI) and Boos (co-PI).

Courses Taught (Last 5 Years)

- ST 370 Probability and Statistics for Engineers
- ST 372 Introduction to Statistical Inference and Regression
- ST 508 Statistics for the Behavioral Sciences II
- ST 511 Experimental Statistics for the Biological Sciences I
- ST 515 Experimental Statistics for Engineers I

Advised 8 Masters Students in last 3.5 years including current advisees
R.. Webster West, Curriculum Vitae

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North Carolina State University
Campus Box 8203
Raleigh, NC 27695-8203

Office: 919-515-1954
Department: 919-515-2528
FAX: 919-515-1169
websterwest@gmail.com

Education:

PhD, Statistics, Rice University, August 1994, Thesis Advisor: James R. Thompson
BS, Mathematics, University of Arkansas, May 1990, Summa Cum Laude

Positions and Employment:

Founder and CEO, Integrated Analytics LLC, May 2001 - present
Professor, Department of Statistics, North Carolina State University, January 2013
Professor, Department of Statistics, Texas A&M University, May 2008 - present
Associate Professor, Department of Statistics, Texas A&M University, May 2006 - May 2008
Associate Professor, Department of Statistics, University of South Carolina, August 2000 - May 2006
Assistant Professor, Department of Statistics, University of South Carolina, August 1994 - July 2000

Other Relevant Experiences and Professional Memberships:

Chair-elect for the graphics section of the American Statistical Association (2011)
President of the Southeast Texas Chapter of the American Statistical Association (2008-2012)
Causeweb advisory group (2007 - present)
Associate Director of Online Learning (May 2006 - January 2010)
Applet developer, Prentice Hall (Summer 2005), Pearson (Summer 2007)
President of the South Carolina Chapter of the American Statistical Association (1998-2000)
Summer Research Faculty, Naval Surface Warfare Center, Dahlgren Division, Advanced Computation Technology Group (Summer 1997)


Honors:

2011 Teaching and Learning Award of Excellence for StatCrunch
2005 MERLOT Classics Award in Mathematics and Statistics for StatCrunch
2005 Causeweb Resource of the Year Award for StatCrunch
Selected Peer-Reviewed Publications (Last 5 Years)


Research Support (Last 3 Years):


Courses Taught (Last 5 Years at Texas A&M University):

STAT 201, Elementary Statistical Inference

STAT 211, Principles of Statistics I

STAT 604, Special Problems in Statistical Computations and Analysis

Recent Graduate Training Experience (Last 5 Years):

Currently supervise one Ph.D. student (Paul Martin, Texas A&M University)

Ph.D Students Supervised:

John Wagaman, Texas A&M University, Fall 2009.

Thomas Jaki, University of South Carolina, Summer 2006.

Yuping Wu, University of South Carolina, Summer 2006.

Advised 2 Masters Students in last 3.5 years including current advisees.
Roger D. Woodard
Assistant Department Head, Director of Undergraduate Programs
Associate Professor
Department of Statistics
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North Carolina State University
Raleigh, NC 27695
(919) 515-1938
woodard@stat.ncsu.edu

Education
B.A., Mathematics, Culver Stockton College, Canton, Missouri, 1990-1992

Positions and Employment
Graduate Instructor, University of Missouri, 1994-1998
Research Assistant, University of Missouri, 1998-1999
Visiting Assistant Professor, Washington University-Saint Louis, 1999-2000
Program Specialist Statistics Education, Department of Statistics, The Ohio State University, 2000-2003
Assistant Professor, Department of Statistics, North Carolina State University, 2003-2008
Associate Professor, Department of Statistics, North Carolina State University, 2008-present
Undergraduate Program Director, Department of Statistics, North Carolina State University, 2007-present
Assistant Department Head, Department of Statistics, North Carolina State University, 2011-present

Other Relevant Experiences and Professional Memberships
• Statistics Editor, National Sciences Digital Library (NSDL) and Multimedia Educational Resource for Online Teaching and Learning (MERLOT), 2003-2007
• Peer reviewer, The American Statistician, 2007-2009
• Advisory board member, Scaling up STEM Learning with the VCL an NSF funded grant, 2008-2012
• Organizer U.S. Conference on Teaching Statistics (USCOTS). 2011 and 2013
• Advisory board member, OnlineStatbook.com an NSF funded grant, 2009-2012

Honors
• Recipient of the North Carolina State University Outstanding Teacher Award, 2006
• Recipient of the American Statistical Association Waller Education Award for excellence and innovation in teaching introductory statistics, 2005
• Recipient of the LeRoy and Elva Martin Award for Teaching Excellence, 2005
• Recipient of the University of Missouri Parent’s Association Donald K. Anderson Graduate Student Teaching Award, 1997
• Recipient of the University of Missouri Greek Week Faculty of the Year Award, 1995
• Recipient of the University of Missouri Graduate Professional Council Outstanding Member of the Year Award, 1995

Selected Peer Reviewed Publications


**Research Support**

- Principal Investigator, Distance Education and Learning Technologies Large Course Redesign Program, $30,000 for *Large Course Redesign Pilot Grant Proposal for Introduction to Statistics*. Develops a hybrid version of Introductory Statistics. 2010-2011
- Senior Personnel, National Science Foundation, $500,416 for *Preparing to Teach Mathematics with Technology (PTMT): An Integrated Approach*. External evaluator for a project that uses technology modules to teach probability, statistics, and geometry to pre-service teachers. 2008-2012
- Principal Investigator, National Science Foundation, $600,000 for *Mentoring Students to Total Success*. Supports the mentoring of financially needy students in achieving total success: excellent academic performance, broad experiences and exposure, timely graduation, and informed career choice. 2008-2013

**Courses Taught:**

- **Statistics 311** – A large introductory course for a broad variety of majors.
- **Statistics 312** – A second course for a broad variety of majors.
- **Statistics 431** – A course in experimental design for undergraduate statistics majors.
- **Statistics 432** – A course in statistical sampling for undergraduate statistics majors.
- **Statistics 435** – A course in statistical process control and improvement for undergraduate statistics majors.
- **Statistics 507** – The first in a two course sequence in statistics for graduate students in the behavioral sciences.
- **Statistics 511/512** – A two course sequence in statistics for graduate students in the biological sciences.
- **Statistics 513** – The first in a two course sequence in statistics for graduate students in the management sciences.

**Graduate Training Experience:**

- Currently supervise one PhD student (Jennifer Sloan) in statistics education.
- Marggie Gonzalez: Mathematics Education - MS 2010
- Tina Starling: Mathematics Education - PhD 2011
- John Pritchett: Mathematics Education - PhD ongoing
- Cody Peebles: Nuclear Engineering - MA 2007, PhD ongoing
- Sarah Mikol: Statistics - MS 2009
- Holt Wilson: Mathematics Education - PhD 2009
- Lina Cardenas: Textiles Chemistry - MS 2005, PhD 2009
- Beth Newcome: Textiles - PhD 2009
- Suvalee Tangboonrithithai: Textiles - PhD 2009
YICHAO WU  
Assistant Professor  
Department of Statistics  
Campus Box 8203  
North Carolina State University  
Raleigh, NC 27695-8203  
Telephone: 919-513-7677  
Fax: 919-515-7591  
E-Mail: wu@stat.ncsu.edu

Education
B.S. 1999 Nankai University Mathematics  
M.S. 2003 University of North Carolina Applied Mathematics  
Ph.D. 2006 University of North Carolina Statistics

Positions and Employment
2006-2008  Postdoctoral Research Associate, Department of ORFE, Princeton University  
2008-Present  Assistant Professor, Department of Statistics, NCSU

Other Relevant Experiences and Professional Memberships
Aug 2012 - , Associate Professor, Department of Statistics, Temple University (on leave from NCSU)

Honors
NSF Early Career Development (CAREER) Award, February 2011.  
NCSU Sigma Xi Faculty Research Award, April 2011.

Selected Peer-Reviewed Publications (Last 5 Years)


**Research Support (Last 3 Years)**

**National Science Foundation (NSF) CAREER Award Grant**

Grant number: DMS-1055210, $400,000. 09/01/11 - 08/31/16

Title: CAREER: New Statistical Methods for Classification and Analysis of High Dimensional and Functional Data

Role: Sole-PI

**National Institutes of Health (NIH)/National Cancer Institute R01 Grant**

Grant number R01CA149569, $1,519,658. 02/01/10 - 12/31/14

Title: Flexible Statistical Machine Learning Techniques for Cancer-related Data

Role: PI (The other PI is Yufeng Liu, UNC)

**National Science Foundation (NSF) Standard Grant**

Grant number: DMS-0905561, $120,000. 07/01/09 - 06/30/12

Title: Development of Statistical Methods for High-dimensional and Complex data

Role: Sole-PI

**NCSU Faculty Research and Professional Development Award Grant**

Grant Amount: $4,000. 07/01/09 - 06/30/10

Title: High-dimensional learning and variable selection

Role: Sole-PI

**Courses Taught (Last 5 Years)**

- ST 370 Probability and Statistics for Engineers
- ST 372 Introduction to Statistical Inference and Regression
- ST 521 Statistical Theory I
- ST 790 Nonparametric Regression and Smoothing

**Recent Graduate Training Experience (Last 5 Years)**

Currently supervise two Ph.D. students: Dehan Kong (with Howard Bondell) and Seung Jun Shin (with Hao H. Zhang).

**Ph.D Students Supervised**


Advised 13 Masters Students in last 3.5 years including current advisees
Zhao-Bang Zeng
William Neal Reynolds Distinguished Professor
Bioinformatics Research Center
Department of Statistics, Department of Genetics
North Carolina State University
Raleigh, NC 27695-7566
Email: zeng@stat.ncsu.edu

Education
1978-1982     B.Sc.     Animal Science, Huazhong Agricultural University, Wuhan, China

Positions and Employment
1982.2-1983.9    Department of Animal Science, Huazhong Agricultural University, Wuhan, China, Assistant Lecturer
1986.10-2001.6  Department of Statistics, North Carolina State University
Postdoctoral Research Associate (1986.10-1990.11) (with the late Prof. C. Clark Cockerham) 2001.7-2005.6  Professor, Department of Statistics, Department of Genetics & Bioinformatics Research Center, NC State U
2006.1-2011.6  Director, Bioinformatics Research Center, Director, Bioinformatics Graduate Program
2006.1-2011.6  Co-Director, Genomics Science Graduate Programs;
2006.1-        Director, NIH/NIEHS Bioinformatics Graduate Training Program
2005.7-        William Neal Reynolds Distinguished Professor, Department of Statistics, Department of Genetics & Bioinformatics Research Center, NC State U

Other Relevant Experiences and Professional Memberships
2004—            Editorial Board, Genetics and Genomics
2005—            Associate Editor, BMC GENETICS
2006—            Editorial Board, ACTA AGRONOMICA SINICA
2002-2006        NIH/NIGMS Biomedical Research and Research Training Committee
2005, 2009        NIH Genomics, Computational Biology and Technology Study Section
2006             NIEHS Director's Challenge Initiatives Program Review
2007             NIH Behavioral Genetics and Epidemiology Study Section
2007-2009        NIEHS Environmental Health Sciences Review Committee
2002-2005        Representative of the Eastern and Western North American Regions of the International Biometric Society (ENAR/WNAR) to Section G: Biological Sciences of the American Association for the Advancement of Science (AAAS)
2004             Organizer of invited session on “Gene Expression QTL Analysis”, The Joint Statistics Meetings, Toronto
2006-2007        Co-Chair of the Organizing Committee of “The Third International Conference on Quantitative Genetics”, August 18-24, 2007, Hangzhou, China

Honors and Awards
2001            D. D. Mason Faculty Award, Department of Statistics, North Carolina State University
2005            William Neal Reynolds Distinguished Professorship
2008            Fellow of the American Statistics Association

Selected Peer-Reviewed Publications (Last 5 Years)

Research Support (Last three years)
2006-2010 NIEHS 2 T32 ES007329: “Graduate Training in Bioinformatics”, Director, $1,954,757
2009-2012 NIH R24GM078233 “Metabolomics Network for Drug Response Phenotype”, PI for subcontract from Duke U. $200,000
2009-2011 NSF “Acquisition of Massively Deep-read Sequencing Technology at NCSU”, Co-PI. $452,500
2010-2015 NIEHS 5 T32 ES007329: “Graduate Training in Bioinformatics”, Director, $2,189,496
2012-2014 North Carolina Biotechnology Center/Syngenta “Multiple interval mapping with epistasis and marker-assisted predictive breeding”, PI. $200,000

Course Taught (Last 5 years)
ST/GN 770 “Statistical Concepts in Genetics”
ST/GN 757 “Statistics for Molecular Quantitative Genetics”
ST 610E “QTL Mapping” (Web-based Distance Learning course)

Recent Graduate Training Experience (Last 5 Years)
Currently supervise one Ph.D. student (Wenjing Lu) in bioinformatics research.
2008 Lingkang Huang, PhD in Bioinformatics and Statistics, NC State Univ. “Variable selection in multi-class support vector machine and applications in genomics data analysis”
2008 David L. Aylor, PhD in Bioinformatics, NC State Univ. “Not just another trait: methods for the genetic analysis of gene expression”
2008 Xuemei Lou, PhD in Bioinformatics, NC State Univ. “Method evaluation and application in complex human genetic diseases” (co-chair with Elizabeth Hauser of Duke University)
2008 Yunjung Kim, PhD in Bioinformatics, NC State Univ. “Analysis of multilocus linkage disequilibrium structure in the human genome”
2008 Youfang Liu, PhD in Bioinformatics, NC State Univ. “Analytic tool for population-based association studies” (co-chair with Jung-Ying Tzeng)
2009 Xiaohua Gong, PhD in Bioinformatics and Statistics, NC State Univ. “Mapping Quantitative Trait Loci in Outbred Half-sib Populations”
2009 Sihui Zhao, PhD in Bioinformatics, NC State Univ. “Analysis of Cis-acting regulatory motifs involved in alternative splicing: (co-chair with Steffen Heber)
2009 Christine W. Duarte, PhD in Bioinformatics and Statistics, NC State Univ. “A new method for genetic network reconstruction in expression QTL data sets”
2010 Luciano Da Costa E Silva, PhD in Statistics, NC State University. “Multiple trait multiple interval mapping of quantitative trait loci from inbred line crosses”
2012 Hongjie Zhu, PhD in Bioinformatics and Statistics, NC State University. “Pharmacometabolomics data analysis and nonlinear sufficient dimension reduction for genome-scale studies”
EDUCATION

B.S. 1983 South China Normal University Mathematics
M.S. 1986 Peking University Applied Mathematics
Ph.D. 1997 University of Michigan Biostatistics

POSITIONS AND EMPLOYMENT

1998-2004 Assistant Professor, Department of Statistics, NCSU
2004-2010 Associate Professor, Department of Statistics, NCSU
2010-Present Professor, Department of Statistics, NCSU

OTHER RELEVANT EXPERIENCES AND PROFESSIONAL MEMBERSHIPS

1996-Present Member of the International Biometric Society/ENAR
1997-Present Member of the American Statistical Association
1998-2001 Regional Advisory Board, International Biometric Society/ENAR
2000-Present Associate Editor for *biometrics*
2002-2005 Associate Editor for *JASA-ACS*
2007 Program Committee for ICSA Applied Statistics Symposium
2004-2007 COPSS Snedecor Award Committee
2006, Spring Assistant Director, Sanofi-Aventis
2006-2007 Chair, COPSS Snedecor Award Committee
2008-2011 Associate Editor for *JASA-TM*
2010-Present Associate Editor for *Statistics in Biosciences*
2011 Local Organization Committee, IISA

HONORS

“Thank a Teacher” Award (2011, by NCSU)
Fellow of the American Statistical Association (2012)

SELECTED PEER-REVIEWED PUBLICATIONS (LAST 5 YEARS)


**Research Support (Last 3 Years)**

NIH Grant MH84022-01, 2009-2012, $627,149, “Genome-Wide Haplotype Association Analysis in Mental Disorders.” Co-investigator (PI: J.Y. Tzeng).


NIH Grant R01 CA85848-12, “Flexible Statistical Methods for Biomedical Data.” Co-investigator (PI: M. Davidian).

**Courses Taught (Last 5 Years)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST 361</td>
<td>Introduction to Statistics for Engineers</td>
</tr>
<tr>
<td>ST 520</td>
<td>Statistical Principles of Clinical Trials and Epidemiology</td>
</tr>
<tr>
<td>ST 744</td>
<td>Categorical Data Analysis</td>
</tr>
<tr>
<td>ST 755</td>
<td>Mixed Models and Variance Components</td>
</tr>
</tbody>
</table>

**Recent Graduate Training Experience (Last 5 Years)**

Currently supervising 5 Ph.D. students (Paul Bernhardt, Pedro Terres, Dong Wang, Xin Wang, Guolin Zhao)

**Ph.D Students Supervised:** Miao Yu (2007, with Wenbin Lu), Huiping Miao (2009), Mingyan Huang (2010), Song Yan (2011, with Wenbin Lu).

**Advised 7 Masters Students in last 3.5 years including current advisees**
Hao Helen Zhang  
Associate Professor  
Department of Statistics  
Box 8203  
North Carolina State University  
Raleigh, NC 27695-8203  
919-607-3371  
919-515-7591  
hzhang2@ncsu.edu

Education/Training
Peking University, Mathematics, B.Sc. 1991-2006
University of Wisconsin-Madison, Statistics, Ph.D., 1997-2002

Positions and Employment
Assistant Professor, Department of Statistics, North Carolina State University, 2002-2008
Associate Professor, Department of Statistics, North Carolina State University, 2008-
Associate Professor, Department of Mathematics, University of Arizona, 2011-

Professional Activities & Memberships

Editorial Service
Editorial Board, Journal of Clinical Bioinformatics (2010-); Panel, National Science Foundation

Service to Professional Society and Conferences
ENAR Regional Advisory Board, 2004-2007
Publication Officer (Elected), ASA Nonparametrics Section, 2011-present.
IMS Program Co-Chair, ENAR, New Orleans, LA, March 2010.
Area Chair, 15th International Conferences on Artificial Intelligence and Statistics (AISTAT), 2011.
Program Committee, ASA’s Section on Statistical Learning and Data Mining, 2012; IISA Conference on Probability, Statistics, and Data Analysis, 2011; Southern Regional Council on Statistics (SRCOS), Norfolk, VA, 2010; 13th International Conferences on Artificial Intelligence and Statistics, Italy, 2010.

Research/Mentoring Outreach
Faculty Fellow, SAMSI, 2010-2011, 2003-2004; Kenen Fellow Mentor, 2008-2010

Member
Institute of Mathematical Statistics (IMS), American Statistical Association (ASA)

Honors
National Science Foundation Faculty Early Career Development (CAREER) Award, 2007
Institute of Mathematical Statistics (IMS) Laha Travel Award, 2003
Faculty Research and Professional Development Award, North Carolina State University, 2003
Vilas Professional Development Fellowship, University of Wisconsin-Madison, 2001

Selected Peer-Reviewed Publications (Last 5 Years)

**Research Grants (Last 3 Years)**

1. National Security Agency (NSA), 101015-Zhang. 01/01/12-12/31/13. “Computational Approaches to Feature Selection For Massive Data.” Total $117,665. Role: PI
2. NSF CAREER Award, DMS-0645293. 07/01/07-06/30/12. “Nonparametric Models Building, Estimation, and Selection with Applications to High Dimensional Data Mining.” Total: $400,000. Role: PI
4. NIH/NCI, 2R01 CA085848-12, 08/01/11- 03/30/15. “Flexible Statistical Methods for Biomedical Data.” (Davidian). Total: $873,274. Role: Co-I (20%).
5. NIH/NCI, R01 CA085848-08, 05/01/07- 04/30/11. “Flexible Statistical Methods for Biomedical Data.” (Davidian). Total: $1,155,376. Role: Co-I (20%)
6. NIH/NCI, P01 CA 142538-01. 04/01/10 - 03/31/15. “Statistical Methods for Cancer Clinical Trials.” (Davidian/Kosorok/George). Total: $4,526,516. Role: Co-I (25%)

**Courses Taught (Last 5 Years)**

1. STAT 521: “Statistical Inference I”, 2006 Fall, 2008 Fall, 2009 Fall
4. STAT 790C: “Introduction to Data Mining and Machine Learning”, 2005 Fall, 2007 Fall, 2010 Spring

**Recent Graduate Training Experience**

**Current Ph.D. Students**

(1) SeongJun Shin (Ph.D.), high dimensional data mining; (2) Yuan Geng (Ph.D.), biostatistics and survival analysis and model selection; (3) Wei Xiao (Ph.D.): semiparametric model selection.

**Ph.D. Theses Directed**

12. Qianchuan Chad He, UNC-CH, 2012, Ph.D.
Education

B.S. 2001 China Medical University Medicine
M.S. 2003 Iowa State University Bioinformatics and Computational Biology
Ph.D. 2008 Stanford University Statistics

Positions and Employment

2008-2010 Post-doctoral Fellow, Department of Human Genetics, UCLA
2010-Present Assistant Professor, Department of Statistics, NCSU

Other Relevant Experiences and Professional Memberships

2010-present Associate Editor for the Annals of Applied Statistics

Honors

AMS Simons Travel Grant, 2012
Travel Award, Pacific Symposium of Biocomputing, 2011

Selected Peer-Reviewed Publications (Last 5 Years)


Research Support (Last 3 Years)

NIH Grant R01 HG006139 2011-2015 $359,971, “Genomics, GPUs, and next generation computational statistics”, Sub-award PI

NCSU FRPD Grant 2011-2012 $4,000, “Computational tools for statistical analysis of high-dimensional data”, PI

Courses Taught (Last 5 Years)

ST 758 Computation for Statistical Research
ST 370 Introductory Probability and Statistics for Engineers

Recent Graduate Training Experience (Last 5 Years)

Currently supervise three Ph.D. students (Bo Zhang, Yiwen Zhang, Anran Wang)

Ph.D Students Supervised

None

Advised 6 Masters Students in last 3.5 years including current advisees